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United States  
Department of  
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Midwest National Technical Center  
Soil Mechanics Laboratory  
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Lincoln, NE 68508-2919

Subject: WEPP - 1987 Cropland Samples -  
Soil Mechanics Tests

Date: September 7, 1988

To: John M. Laflen, Research Leader  
Nat'l. Soil Erosion Research Laboratory  
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File code: 210-22

U.S.D.A., NAL

MAY 04 2005

CATALOGING PREP

Eighteen samples were sent to the SCS Soil Mechanics Laboratory at Lincoln, Nebraska, for soil mechanics tests. The samples were collected during the summer of 1987.

The tests that we were scheduled to make are as follows:

1. Atterberg limits
2. Middleton dispersion ratio (modification)
3. Unconfined compressive strength
4. Direct shear at low confining pressure
5. Consolidation tests with permeability measurements
6. Pinhole test for dispersion/erodibility

The samples tested are listed on the attached form SCS-ENG-354 (Attachment A). The Atterberg limit test data are recorded on the attached forms SCS-ENG-354.

The Middleton dispersion ratio along with the SCS percent dispersion values are recorded on the attached form SCS-ENG-354 (Attachment A).

The Middleton dispersion ratio from USDA Technical Bulletin No. 178, "Properties of Soil Which Influence Soil Erosion" by H. E. Middleton is defined as the ratio, expressed in percentage, of silt and clay to the total silt and clay obtained by mechanical analyses. The gradation data for the samples are recorded on the attached form SCS-ENG-354. The size range finer than the No. 200 sieve (0.074 mm) was determined by hydrometer. The first line entry for each sample represents the total size fraction determined with a standard hydrometer analyses test using a chemical dispersing agent. The second line entry for each sample represents the size fraction by hydrometer analyses without a dispersing agent added. Refer to ASTM D4221 "Dispersive Characteristics of Clay Soil by Double Hydrometer" for the test procedure.

The entries in the percent dispersion column on the attached form SCS-ENG-354 are for the double hydrometer procedure (ASTM D4221). The column labeled



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1871  
JAN 20 1871  
JAN 20 1871



Middleton dispersion ratio is the percent passing 0.05 mm for the second line entry divided by the total percent passing 0.05 mm (first line entry).

The specific gravity of the solid fraction finer than the No. 10 size is recorded for each sample on the attached form SCS-ENG-354.

Prior to making tests for direct shear, unconfined compression, consolidation with permeability, and pinhole tests it was necessary to determine a test density. In discussion with John Laflen we agreed to make the tests at the after rain density listed in Attachment B.

Direct shear tests were made on each of the samples. The test density was the after rain density listed in Attachment B. The test specimens were flooded prior to testing. The tests were made at low normal loads of 2, 4, and 6 lb/in<sup>2</sup>. The shear test parameters obtained represent the consolidated drained conditions. The data are reported in attachment C and are summarized in Attachment A.

Unconfined compression tests were made on each of the samples. The test specimens were molded to the after rain density. They were placed in a rubber membrane in a triaxial cell and water was percolated through the specimens for about 16 hours to saturate them. Following the saturation process, the specimens were loaded to failure. The test data are in Attachment D and are summarized as follows:

#### Unconfined Compression Tests

Sample No.	Soil	Test $\gamma_d$ g/cm <sup>3</sup>	W After Test %	Strain @ Failure %	Shear Strength c, lb/ft <sup>2</sup>
88C89	Abilene	1.50	16.5	1.3	190
88C90	Academy	1.61	17.0	1.7	180
88C91	Barnes	1.14	26.6	1.0	190
88C92	Barnes	1.20	31.8	2.0	215
88C93	Heiden	0.99	36.5	5.0	250
88C94	Hirsh	1.43	19.7	1.3	135
88C95	Keith	1.32	28.2	2.0	230
88C96	Los Banos	1.0		11.0	280
88C97	Pierre	1.05	39.6	4.0	350
88C98	Palouse	1.15	31.3	6.0	285
88C99	Portneuf	1.25	31.7	4.0	315
88C100	Sharpsburg	1.14	35.8	4.0	225
88C101	Sverdrup	1.46	20.3	1.5	190
88C102	Walla Walla	1.25	32.6	2.0	280
88C103	Whitney	1.54	15.6	2.0	200
88C104	Williams	1.16	29.0	1.0	190
88C105	Woodward	1.41	25.0	2.0	260
88C106	Zahl	1.25	27.5	3.0	240



Consolidation Tests

Consolidation tests were made on all samples. The test specimens were made to the after rain density in the consolidometer. Prior to loading, the samples were flooded. The first test on each sample was made by loading to 500 lb/ft<sup>2</sup>, 1,000 lb/ft<sup>2</sup>, 2,000 lb/ft<sup>2</sup>, 4,000 lb/ft<sup>2</sup>, and 8,000 lb/ft<sup>2</sup>. Permeability measurements were made at 2,000 lb/ft<sup>2</sup>, 4,000 lb/ft<sup>2</sup>, and at 8,000 lb/ft<sup>2</sup> loads. When we looked at the consolidation and permeability test data from these tests, we found that the permeability versus void ratio relationship could not be projected back to estimate the permeability at placement void ratio because too much volume change had occurred on most of the samples. Additional tests were then made in which the loading sequence was 100 lb/ft<sup>2</sup>, 500 lb/ft<sup>2</sup>, 1,000 lb/ft<sup>2</sup>, and 2,000 lb/ft<sup>2</sup> with permeability measurements made at each load. The consolidation test data are reported in Attachment E. The data are reported as void ratio versus consolidating pressure and percent consolidation versus consolidating pressure.

The following is a summary of the percent consolidation versus load. Eleven of the 18 samples were tested twice. The first test was made with the loading sequence started at 0.5 ksf and with doubling load increments thru 8 ksf. The second test was made with the load starting at 0.1 ksf and with load increments thru 2 ksf. For 6 of the 11 samples on which two tests were made, the percent consolidation versus load for the .5, 1.0, and 2.0 ksf loads were very close to the same. On the other 5 of 11 samples where two tests were made there were some fairly large differences in the amount of consolidation under the same load between the two tests. The same procedure was used to prepare the specimens for each test and the test density was very close to the same so the difference is likely due to different size of voids in the two specimens due to slightly different aggregation.

Sample No.	Test $\gamma_d$		Percent Consolidation Under These Loads (ksf)						
	lb/ft <sup>3</sup>	g/cm <sup>3</sup>	.1	.25	.5	1.0	2.0	4.0	8.0
88C89 Abilene	93.6	1.50			6.04	7.55	9.33	10.98	12.47
88C90 Academy	100	1.60			8.55	10.9	12.9	15.1	17.2
88C91 Barnes	71.7	1.15			20.3	24.6	27.9	31.3	34.8
	71.2	1.14	12.4	17.9	21.0	24.5	27.8		
88C92 Barnes	75.0	1.20			8.2	12.5	16.8	19.5	24.5
	74.9	1.20	4.2		14.0	17.9	22.1		
	74.9	1.20	6.2		13.2	18.0	21.7		
88C93 Heiden	61.9	0.99			19.3	25.6	31.2	35.5	39.1
	61.8	0.99	2.0		15.9	22.8	28.5		
88C94 Hirsh	86.7	1.39			12.0	13.6	15.2	16.7	18.1
	86.8	1.39	11.6		15.4	17.6	19.2		
	86.8	1.39	17.0		20.0	21.4	22.7		





Sample No.	Test $\gamma_d$		Percent Consolidation Under These Loads (ksf)						
	lb/ft <sup>3</sup>	g/cm <sup>3</sup>	.1	.25	.5	1.0	2.0	4.0	8.0
88C95 Keith	82.4	1.32			8.3	12.5	15.9	18.9	22.2
	82.4	1.32	-.5		6.7	10.9	14.7		
88C96 Los Banos	62.4	1.0			22.3	25.7	30.5	34.8	39.0
	62.4	1.0	9.5		22.8	27.4	31.7		
88C97 Pierre	65.6	1.05			12.1	16.4	22.5	28.0	33.1
			-.6		12.0	18.0	23.2		
88C98 Palouse	71.8	1.15	14.8		21.2	24.0	26.8		
88C99 Portneuf	78.0	1.25			4.3	7.8	11.0	14.6	18.3
88C100 Sharpsburg	71.2	1.14			8.9	13.5	17.9	22.1	26.7
	71.2	1.14	-.05		11.5	16.3	21.0		
88C101 Sverdrup	91.1	1.46			10.1	13.4	16.2	18.3	20.7
	91.1	1.46	1.3		10.1	13.5	16.6		
88C102 Walla Walla	78.0	1.25			4.4	7.5	10.5	13.6	17.0
88C103 Whitney	96.1	1.54			13.4	15.1	16.9	18.8	20.9
	96.1	1.54	-.6		12.5	13.8	15.0		
88C104 Williams	72.4	1.16			17.9	21.9	26.2	29.8	33.4
			4.9		17.9	22.0	25.5		
88C105 Woodward	88.0	1.41			5.0	8.8	11.7	14.7	17.6
88C106 Zahl	78	1.25			10.4	15.2	18.6	23.2	27.2
	78	1.25	5.2		14.8	18.6	21.9		

### Permeability

Permeability tests were made on the consolidation test specimens during the consolidation test. The consolidation test specimens were placed at or near the after rain density and flooded prior to the test. Following consolidation under a given load, a falling head permeability test was made. The procedure used is similar to that described in the Canadian Geotechnical Journal, Vol. 20, No. 4, November 1983, "The Permeability of Natural Soft Clays. Part I: Methods of Laboratory Measurement.

Permeability measurements made at different void ratios are plotted as void ratio  $e$  versus the log of permeability coefficient  $k$ . From this plot the permeability at the initial void ratio of the specimen can be determined. Part II: Permeability Characteristics in the above referenced paper states that the  $e$  versus log  $k$  relationship are linear for volumetric strains of from 0 - 20% and that beyond





20% a more or less curvature occurs indicating a faster reduction in permeability with void ratio. Eleven of the first consolidation test specimens had more than 20% consolidation so additional test with a lesser loading along with permeability measurements were made to provide the basis for estimating permeability at the after rain density. The  $e$  versus  $\log k$  data are in Attachment F.

The estimated permeability at the after rain density for each of the samples are as follows:

Sample No.	After Rain $\gamma_d$ , g/cm <sup>3</sup>	Test $\gamma_d$ g/cm <sup>3</sup>	k (ft/day)
88C89 Abilene		1.5	15
88C90 Academy	1.61	1.6	0.8
88C91 Barnes, MN		1.15	8
88C92 Barnes, ND	1.20	1.20	3.5
88C93 Heiden	.99	0.99	3
88C94 Hirsh	1.43	1.39	10
88C95 Keith	1.32	1.32	0.6
88C96 Los Banos	1.0	1.0	10
88C97 Pierre	1.05	1.05	1.0
88C98 Palouse	1.15	1.15	1.0
88C99 Portneuf	1.25	1.25	0.3
88C100 Sharpsburg		1.14 (tilled)	6.0
88C101 Sverdrup	1.46	1.46	5.0
88C102 Walla Walla		1.25	0.3
88C103 Whitney	1.54	1.54	0.9
88C104 Williams	1.16	1.16	10.0
88C105 Woodward	1.41	1.41	2.0
88C106 Zahl	1.25	1.25	2.0

#### Critical Shear Stress

The pinhole test procedure was modified to provide a basis for estimating critical shear. This was done by making flow through quantity measurements starting at a head of  $\frac{1}{2}$  inch and then increasing the head slightly in increments. Critical shear stress was assumed to be the point at which erosion of particles started to enlarge the preformed hole. This point was judged by comparing measured rates of flow through under a given head to the computed curve of flow through versus preformed hole diameter.

The first trial for each sample was made at the after rain density and then two more trials were made to determine if we could measure differences in critical shear stress with a change in soil density.

The values of critical shear stress estimated by this method for three different placement densities are as follows:



Sample No.	Soil Series	TRIAL 1		TRIAL 2		TRIAL 3	
		$\gamma_d$ g/cm <sup>3</sup>	Crit. Shear N/m <sup>2</sup>	$\gamma_d$ g/cm <sup>3</sup>	Crit. Shear N/m <sup>2</sup>	$\gamma_d$ g/cm <sup>3</sup>	Crit. Shear N/m <sup>2</sup>
88C89	Abilene	1.50	0.94	1.60	1.29	1.70	1.20
88C90	Academy	1.61	4.19	1.60	1.78	1.70	3.47
88C91	Barnes, MN	1.14	12.03	1.05	3.56	1.07	1.01
88C92	Barnes, ND	1.20	2.08	1.05	0.95	1.25	2.94
88C93	Heiden	0.99	10.76	0.85	10.63	0.75	3.46
88C94	Hirsh	1.43	1.16	1.60	0.66	1.70	0.59
88C95	Keith	1.32	0.73	1.40	2.52	1.50	1.89
88C96	Los Banos	1.00	10.52	0.85	7.78	0.75	6.44
88C97	Pierre	1.05	No erosion	0.90	No erosion	0.75	12.84
88C98	Palouse	1.15	12.93	1.00	0.88	1.07	2.27
88C99	Portneuf	1.25	1.45	1.35	2.46	1.50	2.06
88C100	Sharpsburg	1.14	2.86	1.20	6.81	1.10	8.02
88C101	Sverdrup	1.46	4.94	1.55	4.17	1.40	3.18
88C102	Walla Walla	1.25	1.84	1.40	1.00	1.50	4.36
88C103	Whitney	1.54	1.03	1.65	0.71	1.70	3.08
88C104	Williams	1.16	14.15	1.05	12.73	0.90	4.96
88C105	Woodward	1.41	0.92	1.60	1.29	1.70	1.24
88C106	Zahl	1.25	5.19	1.35	7.56	1.15	3.82





John M. Laflen

7

Effect of Conductivity of Eroding Water on Critical Shear Stress

Four samples were selected for testing with water that was made up to approximate the conductivity of the water that was used for the field trial. The samples selected were fine grained soils. Three of the samples selected had low values for critical shear stress as determined by the laboratory method presented in this report and one had a fairly high value for critical shear stress. These tests were made at the after rain density.

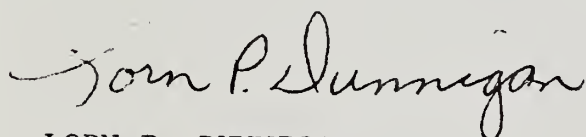
The comparison of critical shear stress for the two types of eroding water are as follows:

Sample	Critical Shear Stress N/m <sup>2</sup>	
	<u>Distilled</u> <u>Water</u>	<u>Field Trial</u> <u>Water Equivalent</u>
Barnes, ND, 88C92	2.08	5.7
Keith, 88C95	0.73	21.3
Los Banos, 88C96	10.5	13.2
Woodward, 88C105	0.92	No erosion

We didn't check the effect of eroding water on any of the nonplastic sandy samples nor more than one of the fine grained soils that showed good erosion resistance because for each of these groups we thought the effect of water conductivity on erosion in this test might be small.

The tests on the Keith soil and the Woodward soil show a significant effect of conductivity of the eroding water on the susceptibility of erosion by this test.

The data sheets for each trial and the explanation of how the conductivity of field trial water was approximated are included in Appendix G.



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Enclosure

cc: w/encl.

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Forms SCS-ENG-354, Soil Mechanics Laboratory Data





SCS-ENG-354  
REV. 3-70  
FILE CODE ENG-13-18

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

SOIL MECHANICS  
LABORATORY DATA  
Form 1-1-3

Attachment 17

2/22/88		FIELD SAMPLE NUMBER	LOCATION AND DESCRIPTION	DEPTH FEET	FIELD CLASS- IFICATION	MECHANICAL ANALYSIS GRAIN SIZE DISTRIBUTION EXPRESSED AS PERCENT FINER BY DRY WEIGHT																				ATTENUE LIMITS		UNIFIED CLASS- IFICATION	SCS GROUP NUMBER	MOISTURE - DENSITY RELATIONSHIPS		UNSATURATED SHEAR STRENGTH		SPECIAL TESTS																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
SAND														SILT						LL	PI	WATER CONTENT %	SHRINKAGE %	FLAT	STANDARD	MODIFIED	CORRE NO			REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL %	REL				

\* = SPAGAN AND WITH THE USE OF DISPERSED AGENT

Notes:  
1. Direct Shear  
2. 1/2" dia  
3. 1/4" dia  
4. 1/8" dia  
5. 1/16" dia  
6. 1/32" dia  
7. 1/64" dia  
8. 1/128" dia  
9. 1/256" dia  
10. 1/512" dia  
11. 1/1024" dia  
12. 1/2048" dia  
13. 1/4096" dia  
14. 1/8192" dia  
15. 1/16384" dia  
16. 1/32768" dia  
17. 1/65536" dia  
18. 1/131072" dia  
19. 1/262144" dia  
20. 1/524288" dia  
21. 1/1048576" dia  
22. 1/2097152" dia  
23. 1/4194304" dia  
24. 1/8388608" dia  
25. 1/16777216" dia  
26. 1/33554432" dia  
27. 1/67108864" dia  
28. 1/134217728" dia  
29. 1/268435456" dia  
30. 1/536870912" dia  
31. 1/1073741824" dia  
32. 1/2147483648" dia  
33. 1/4294967296" dia  
34. 1/8589934592" dia  
35. 1/17179869184" dia  
36. 1/34359738368" dia  
37. 1/68719476736" dia  
38. 1/137438953472" dia  
39. 1/274877906944" dia  
40. 1/549755813888" dia  
41. 1/1099511627776" dia  
42. 1/2199023255552" dia  
43. 1/4398046511104" dia  
44. 1/8796093022208" dia  
45. 1/17592186044416" dia  
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47. 1/70368744177664" dia  
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49. 1/281474976710656" dia  
50. 1/562949953421312" dia  
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52. 1/2251799813685248" dia  
53. 1/4503599627370496" dia  
54. 1/9007199254740992" dia  
55. 1/18014398509481984" dia  
56. 1/36028797018963968" dia  
57. 1/72057594037927936" dia  
58. 1/144115188075855872" dia  
59. 1/288230376151711744" dia  
60. 1/576460752303423488" dia  
61. 1/1152921504606846976" dia  
62. 1/2305843009213693952" dia  
63. 1/4611686018427387904" dia  
64. 1/9223372036854775808" dia  
65. 1/18446744073709551616" dia  
66. 1/36893488147419103232" dia  
67. 1/73786976294838206464" dia  
68. 1/147573952589676412928" dia  
69. 1/295147905179352825856" dia  
70. 1/590295810358705651712" dia  
71. 1/1180591620717411303424" dia  
72. 1/2361183241434822606848" dia  
73. 1/4722366482869645213696" dia  
74. 1/9444732965739290427392" dia  
75. 1/18889465931478580854784" dia  
76. 1/37778931862957161709568" dia  
77. 1/75557863725914323419136" dia  
78. 1/151115727451828646838272" dia  
79. 1/302231454903657293676544" dia  
80. 1/604462909807314587353088" dia  
81. 1/1208925819614629174706176" dia  
82. 1/2417851639229258349412352" dia  
83. 1/4835703278458516698824704" dia  
84. 1/9671406556917033397649408" dia  
85. 1/19342813113834066795298816" dia  
86. 1/38685626227668133590597632" dia  
87. 1/77371252455336267181195264" dia  
88. 1/154742504910672534362390528" dia  
89. 1/309485009821345068724781056" dia  
90. 1/618970019642690137449562112" dia  
91. 1/1237940039285380274899244224" dia  
92. 1/2475880078570760549798488448" dia  
93. 1/4951760157141521099596976896" dia  
94. 1/9903520314283042199193953792" dia  
95. 1/19807040628566084398387907584" dia  
96. 1/39614081257132168796775815168" dia  
97. 1/79228162514264337593551630336" dia  
98. 1/158456325028528675187103260672" dia  
99. 1/316912650057057350374206521344" dia  
100. 1/633825300114114700748413042688" dia





[illegible]









Letter to C. S. Holzhey from Walter J. Rawls





United States  
Department of  
Agriculture

Agricultural  
Research  
Service

Beltsville Area  
Beltsville Agricultural  
Research Center

Beltsville, Maryland  
20705

Attachment B

March 2, 1988

Dr. C. S. Holzhey, SCS  
Federal Bldg, Rm 345  
100 Centennial Mall N.  
Lincoln, NE 68508-3866

Dear Dr. Holzhey:

Enclosed are the bulk density summaries for the WEPP soils ~~you needed for the~~ SCS Soil Mechanics Lab tests. Because of the variability of ~~the tilled bulk density~~ (standard deviation of  $\pm 0.2 \text{ gm/cm}^3$ ), I recommend ~~that the beginning~~ bulk density be about 15 percent less than the reported tilled bulk density and the maximum bulk density be about 25 percent more than the reported 1/3 bar bulk density. For the range soils I would set the range at  $\pm 25$  percent of the 1/3 bar bulk density. I believe these ranges will cover the expected bulk density changes which can occur in the field.

As we discussed at the WEPP meeting, it would be useful if the same conditions and bulk densities the Soil Mechanics Lab uses to run their hydraulic conductivity tests could be used by your lab to determine the 1/3 bar water retention value. Also, if possible, it would be good if for 3 or 4 of the bulk densities the 0.1 bar water retention value could be determined. The water retention data will be useful in testing Ahuja's hydraulic conductivity concepts and would give us a check as to what the sample preparation does to the hydraulic properties of the soil.

I am very excited about the soil data we are compiling. It should help us to better model soil hydraulic properties.

Sincerely,

WALTER J. RAWLS  
Hydrologist  
Hydrology Laboratory

Enclosures

MAR 7 1988





John Caffin - FTS - 284-8673

on 4-4-88 - John Caffin  
suggested after rain & d for  
our tests

87

# WEPP Agricultural Soils

Soil Series	Bulk Density (g/cm <sup>3</sup> )			
	1/3 bar	Dry	Tilled	After Rain
8C100 Sharpsburg	1.28	1.64	1.14	
94 Hersh	1.65	1.70	1.14	1.43
95 Keith	1.48	1.56	.85	1.32
Amarillo	1.62	1.74	.97	1.55
105 Woodward	1.37	1.46	.86	1.41
93 Heiden	1.38	1.80	.66	.99
103 Whitney	1.80	1.82	1.37	1.54
Academy	1.80	1.90	1.35	1.61
96 Los Banos	1.36	1.74	.87	1.00
99 Protneuf	1.33	1.38	.93	1.25
Sagemore	1.40	1.41	.96	1.38
98 Palouse	1.25	1.29	1.00	1.15
106 Zahl	1.50	1.65	1.06	1.25
97 Pierre	1.28	1.51	.88	1.05
104 Williams	1.45	1.62	.90	1.16
92 Barnes ND	1.35	1.50	.93	1.20
101 Sverdrup	1.60	1.67	1.25	1.46
91 Barnes MN	1.45	1.59	1.01	1.14



1987 19

## WEPP Rangeland Soils

MOISTURE CONDITION										
BEFORE DRY					AFTER V. WET					
AREA					AREA					
BURN85	BURN87	INTER- PACE AREA	OPEN AREA	SMALL PLOT	UNDER CANOPY	BURN87	LARGE BARE	CHANNEL ON L.B.	SMALL COVERED	SMALL UNCOVERED

Bulk Density  
g/cm<sup>3</sup> $\frac{1}{3}$  Bar Oven  
Dry

## Soil Series

BULK DENSITY	MEAN	LOCATION											
Strength	1A1			1.48		1.32	1.47	1.65	1.75	1.77	1.90		
Furthest	1A2			1.35			1.46			1.60	1.67		
Durorthis	1B1			2.00		1.25	1.50	1.48	1.57	1.55	1.58		
Not Desa Butte Id	1B2			1.74		1.48	1.44	1.20	1.89	1.81			
Grant	1D1				1.40	1.27	1.33		1.54	1.54	1.41	1.49	
Grant Eroded	1D2				1.42	1.39	1.34		1.47	1.61	1.48	1.53	
Pratt	1E1				1.38	1.39	1.50	1.63	1.52	1.40	1.53	1.53	
Vinlan	1E2				1.27	1.42	1.38			1.54	1.38	1.46	
Vida	1F1				1.30		1.23		1.83	1.48	1.23	1.43	
Pierre	1H1				1.19	1.54	1.33		1.40		1.28	1.51	
Pierre	1H2				1.37		1.17		1.52	1.57			
Hackrey	1I1				1.42		1.40		1.43	1.49	1.39	1.44	
Querencia	1J1				1.55		1.47			1.55	1.31	1.39	
Jauriga	1K1			1.24	1.25	1.05	0.93				1.25	1.37	
Jauriga	1K2	0.94	1.05				1.35						





Direct Shear Test Data



MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		DIRECT SHEAR TEST																																																						
PROJECT and STATE WEPP - Abilene soil			SAMPLE LOCATION Texas																																																							
FIELD SAMPLE NO.		DEPT-	GEOLOGIC ORIGIN																																																							
TYPE OF SAMPLE COMPACTED		TESTED AT S.M. L., LINCOLN		APPROVED BY																																																						
CLASSIFICATION			LL	PI	SPECIFIC GRAVITY																																																					
TYPE OF TEST Consolidated Slow			CONTROL STRAIN		G <sub>s</sub> (-) #4 2.63																																																					
RATE OF LOADING (in./min.) 0.0006			MOISTURE CONDITION FLOODED		G <sub>s</sub> (+) #4																																																					
TYPE OF SPECIMEN ROUND		AREA (sq.in.) 4.9	THICKNESS (in.) 1.0		G <sub>m</sub> (bulk)(+) #4																																																					
<table><tr><td rowspan="7">SHEARING STRESS (τ) psi</td><td>TEST NO.</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>INIT MOISTURE, %</td><td>7.14</td><td>7.14</td><td>7.14</td><td></td></tr><tr><td>DRY DENSITY, <input checked="" type="checkbox"/> g/cc <input type="checkbox"/> pcf</td><td>1.50</td><td>1.50</td><td>1.50</td><td></td></tr><tr><td>INIT VOID RATIO</td><td>.7533</td><td>.7533</td><td>.7533</td><td></td></tr><tr><td>TEST DURATION, (min)</td><td>500</td><td>.483</td><td>500</td><td></td></tr><tr><td>FINAL MOISTURE, %</td><td>17.3</td><td>17.5</td><td>16.35</td><td></td></tr><tr><td>NORMAL STRESS psi</td><td>2</td><td>4</td><td>6</td><td></td></tr><tr><td>MAX. SHEAR STRESS psi</td><td>1.2</td><td>2.0</td><td>2.9</td><td></td></tr><tr><td colspan="3">SHEAR VALUES</td><td>φ°</td><td>c<sub>psf</sub></td><td></td></tr><tr><td colspan="3">AT MAXIMUM STRESS</td><td>23</td><td>50</td><td></td></tr></table>						SHEARING STRESS (τ) psi	TEST NO.	1	2	3	4	INIT MOISTURE, %	7.14	7.14	7.14		DRY DENSITY, <input checked="" type="checkbox"/> g/cc <input type="checkbox"/> pcf	1.50	1.50	1.50		INIT VOID RATIO	.7533	.7533	.7533		TEST DURATION, (min)	500	.483	500		FINAL MOISTURE, %	17.3	17.5	16.35		NORMAL STRESS psi	2	4	6		MAX. SHEAR STRESS psi	1.2	2.0	2.9		SHEAR VALUES			φ°	c <sub>psf</sub>		AT MAXIMUM STRESS			23	50	
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SHEAR VALUES			φ°	c <sub>psf</sub>																																																						
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<table><tr><td rowspan="4">CHANGE IN THICKNESS (%)</td><td rowspan="4">DISPLACEMENT (%)</td><td colspan="2">(9)</td><td colspan="2">(2)</td><td colspan="2">(1)</td></tr><tr><td colspan="2">(1)</td><td colspan="2">(2)</td><td colspan="2">(3)</td></tr><tr><td colspan="2">(2)</td><td colspan="2">(3)</td><td colspan="2"></td></tr><tr><td colspan="2">(3)</td><td colspan="2"></td><td colspan="2"></td></tr></table>						CHANGE IN THICKNESS (%)	DISPLACEMENT (%)	(9)		(2)		(1)		(1)		(2)		(3)		(2)		(3)				(3)																																
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		(1)		(2)				(3)																																																		
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	2	4																																																								
REMARKS																																																										





<b>MATERIALS TESTING REPORT</b>	<b>U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE</b>	<b>DIRECT SHEAR TEST</b>
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PROJECT and STATE <u>WEPP Academy Soil</u>	SAMPLE LOCATION <u>FECIO CF</u>
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FIELD SAMPLE NO	DEPTH	GEOLOGIC ORIGIN
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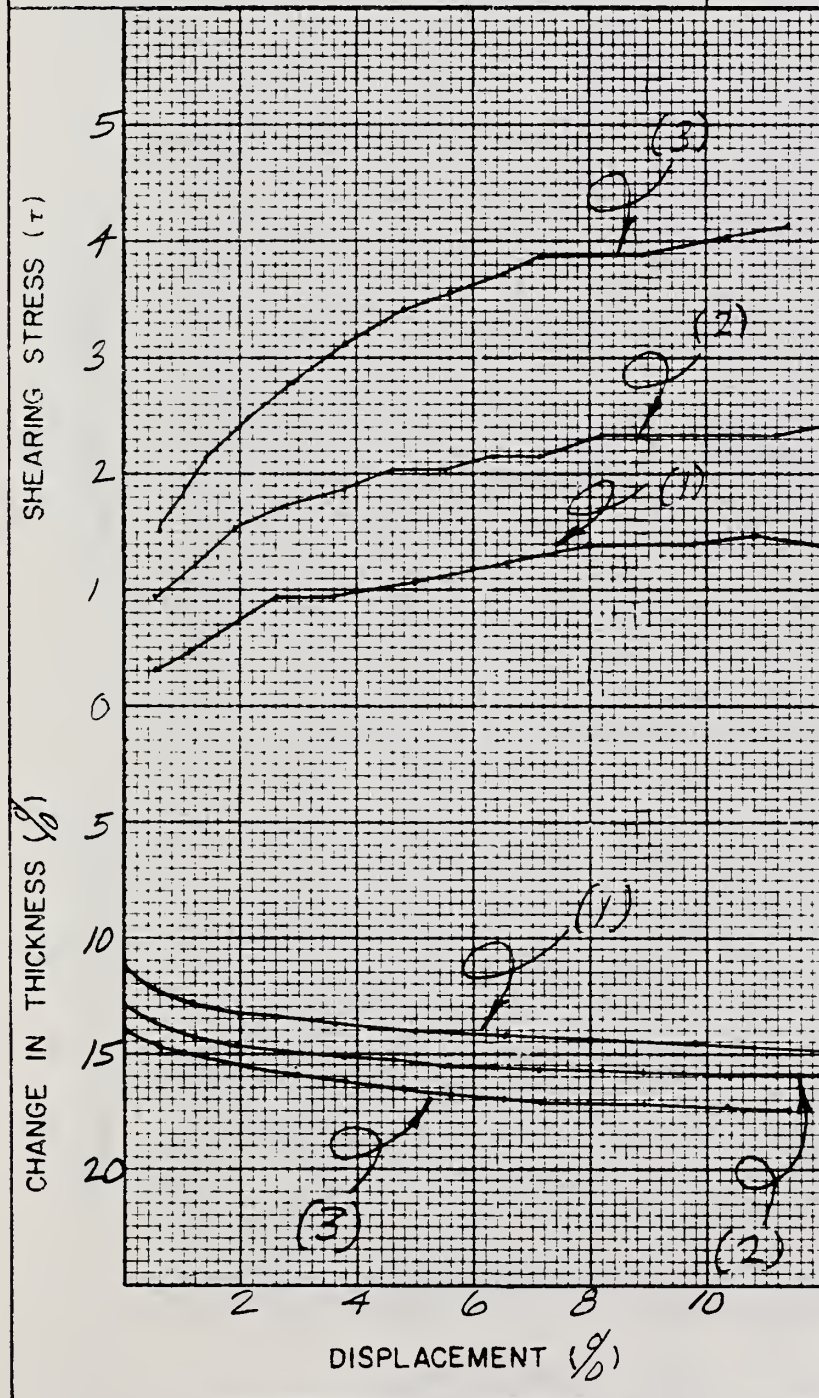
TYPE OF SAMPLE <u>COMPACTED</u>	TESTED AT <u>S.M.L., LINCOLN</u>	APPROVED BY	DATE
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CLASSIFICATION <u>Non-plastic SM</u>	LL	PI	SPECIFIC GRAVITY
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TYPE OF TEST <u>Consolidated Slow</u>	CONTROL <u>STRAIN</u>	G <sub>s</sub> (-) #4	2.75
--	--------------------------	-----------------------	------

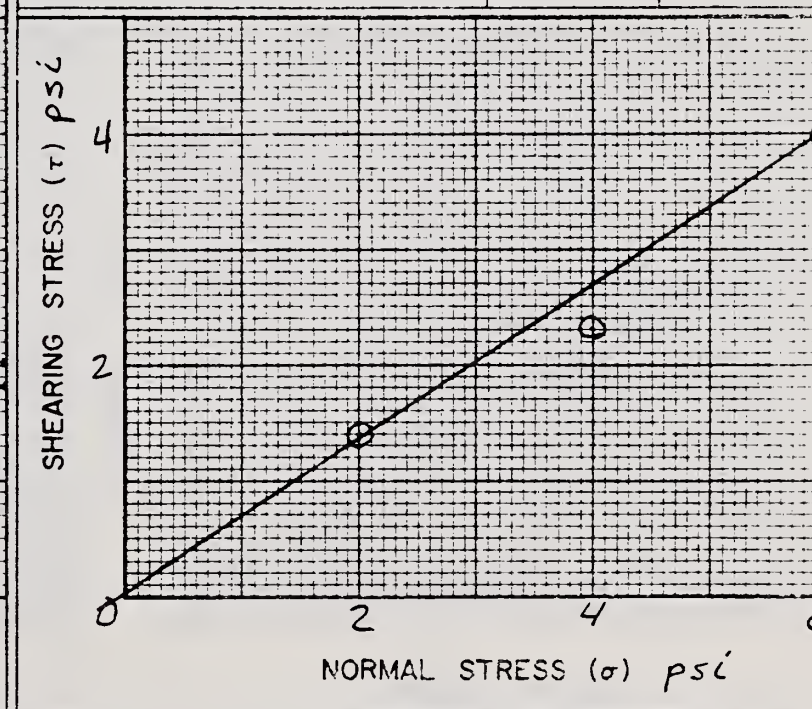
RATE OF LOADING (in/min) <u>0.00064</u>	MOISTURE CONDITION <u>FLOODED</u>	G <sub>s</sub> (+) #4	
--	--------------------------------------	-----------------------	--

TYPE OF SPECIMEN <u>ROUND</u>	AREA(sq.in) <u>4.9</u>	THICKNESS (in.) <u>1.0</u>	G <sub>m</sub> (bulk)(+) #4
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TEST NO.	1	2	3	4
INIT MOISTURE, %	4.6	4.6	5.4	
DRY DENSITY, $\frac{g}{cc}$ <input checked="" type="checkbox"/> $\frac{pcf}{}$	1.61	1.61	1.60	
INIT VOID RATIO	.708	.708	.713	
TEST DURATION, (min.)	470	463	492	
FINAL MOISTURE, %	14.5	14.2	13.5	
NORMAL STRESS $\psi$	2	4	6	
MAX. SHEAR STRESS $\psi$	1.4	2.3	4.0	

SHEAR VALUES	φ	c
AT MAXIMUM STRESS	34°	0



REMARKS





<b>MATERIALS TESTING REPORT</b>		<b>U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE</b>		<b>DIRECT SHEAR TEST</b>																																									
PROJECT and STATE <u>WEPP Barnes Soil</u>			SAMPLE LOCATION <u>MORTIS MN</u>																																										
FIELD SAMPLE NO.	DEPTH	GEOLOGIC ORIGIN																																											
TYPE OF SAMPLE <u>COMPACTED</u>	TESTED AT <u>S.M.L., LINCOLN</u>	APPROVED BY		DATE																																									
CLASSIFICATION <u>CL</u>			LL <u>26</u> PI <u>9</u>		SPECIFIC GRAVITY																																								
TYPE OF TEST <u>Consolidated Slow</u>			CONTROL <u>STRAIN</u>		$G_s(-)^{\#4}$ <u>6.61</u>																																								
RATE OF LOADING (in/min.) <u>0.0006</u>			MOISTURE CONDITION <u>FLOODED</u>		$G_s(+)^{\#4}$																																								
TYPE OF SPECIMEN <u>ROUND</u>		AREA(sq.in.) <u>4.9</u>	THICKNESS (in.) <u>1.0</u>	$G_m(bulk)(+)^{\#4}$																																									
<div style="display: flex; flex-direction: column; align-items: center;"><div style="writing-mode: vertical-rl; transform: rotate(180deg);">SHEARING STRESS (<math>\tau</math>)</div><div style="writing-mode: vertical-rl; transform: rotate(180deg);">CHANGE IN THICKNESS (%)</div></div>		<table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th>TEST NO.</th><th>1</th><th>2</th><th>3</th><th>4</th></tr></thead><tbody><tr><td>INIT MOISTURE, %</td><td><u>11.5</u></td><td><u>11.5</u></td><td><u>11.5</u></td><td></td></tr><tr><td>DRY DENSITY, <math>\frac{g}{cc}</math> <input checked="" type="checkbox"/> <math>\frac{pcf}{}</math></td><td><u>1.14</u></td><td><u>1.14</u></td><td><u>1.14</u></td><td></td></tr><tr><td>INIT VOID RATIO</td><td><u>1.2895</u></td><td><u>1.2895</u></td><td><u>1.2895</u></td><td></td></tr><tr><td>TEST DURATION, (min.)</td><td><u>500</u></td><td><u>483</u></td><td><u>500</u></td><td></td></tr><tr><td>FINAL MOISTURE, %</td><td><u>25.9</u></td><td><u>24.7</u></td><td><u>22.3</u></td><td></td></tr><tr><td>NORMAL STRESS <math>\psi</math></td><td><u>2</u></td><td><u>4</u></td><td><u>6</u></td><td></td></tr><tr><td>MAX. SHEAR STRESS <math>\psi</math></td><td><u>1.3</u></td><td><u>2.7</u></td><td><u>3.8</u></td><td></td></tr></tbody></table>				TEST NO.	1	2	3	4	INIT MOISTURE, %	<u>11.5</u>	<u>11.5</u>	<u>11.5</u>		DRY DENSITY, $\frac{g}{cc}$ <input checked="" type="checkbox"/> $\frac{pcf}{}$	<u>1.14</u>	<u>1.14</u>	<u>1.14</u>		INIT VOID RATIO	<u>1.2895</u>	<u>1.2895</u>	<u>1.2895</u>		TEST DURATION, (min.)	<u>500</u>	<u>483</u>	<u>500</u>		FINAL MOISTURE, %	<u>25.9</u>	<u>24.7</u>	<u>22.3</u>		NORMAL STRESS $\psi$	<u>2</u>	<u>4</u>	<u>6</u>		MAX. SHEAR STRESS $\psi$	<u>1.3</u>	<u>2.7</u>	<u>3.8</u>	
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REMARKS																																													

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<b>MATERIALS TESTING REPORT</b>		<b>U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE</b>		<b>DIRECT SHEAR TEST</b>	
PROJECT and STATE <u>WEPP Barnes Soil</u>			SAMPLE LOCATION <u>-McClusky, ND</u>		
FIELD SAMPLE NO.		DEPTH		GEOLOGIC ORIGIN	
TYPE OF SAMPLE <u>COMPACTED</u>		TESTED AT <u>S.M.L., LINCOLN</u>		APPROVED BY	
CLASSIFICATION <u>CL</u>		LL <u>31</u> PI <u>12</u>		SPECIFIC GRAVITY	
TYPE OF TEST <u>Consolidated Slow</u>			CONTROL <u>STRAIN</u>		$G_s(-)^{\#4}$ <u>2.55</u>
RATE OF LOADING (in/min.) <u>0.00064</u>			MOISTURE CONDITION <u>FLOODED</u>		$G_s(+)^{\#4}$
TYPE OF SPECIMEN <u>ROUND</u>		AREA(sq.in.) <u>4.9</u>		THICKNESS (in.) <u>1.0</u>	
				$G_m(bulk)(+)^{\#4}$	

DISPLACEMENT (%)

TEST NO.	1	2	3	4
INIT MOISTURE, %	13.6	13.6	13.6	
DRY DENSITY, $\frac{lb}{cc}$ $\square$ pcf	1.20	1.20	1.20	
INIT. VOID RATIO	1.1250	1.1250	1.1250	
TEST DURATION, (min.)	478	469	481	
FINAL MOISTURE, %	33.1	30.4	30.3	
NORMAL STRESS psi	2	4	6	
MAX. SHEAR STRESS psi	1.2	2.1	3.6	

SHEAR VALUES		$\phi$	c
AT MAXIMUM STRESS		30°	0

NORMAL STRESS ( $\sigma$ ) psi

REMARKS

Project Overview	
Project Name	Project Alpha
Project Manager	John Doe
Project Start Date	2023-01-01
Project End Date	2023-12-31
Project Status	In Progress
Project Budget	\$1,000,000
Project Risk Level	Medium
Project Complexity	High
Project Scope	Develop and launch a new software product.
Project Objectives	1. Develop a new software product. 2. Launch the software product. 3. Achieve a market share of 10%.
Project Deliverables	1. Software product. 2. Marketing materials. 3. Sales reports.
Project Milestones	1. Project Kick-off. 2. Software development. 3. Software launch.
Project Risks	1. Software development delays. 2. Marketing budget overruns. 3. Sales performance below expectations.
Project Opportunities	1. New market segments. 2. New product features. 3. New sales channels.
Project Challenges	1. Limited resources. 2. High competition. 3. Uncertain market conditions.
Project Success Factors	1. Strong leadership. 2. Effective communication. 3. Timely decision making.
Project Lessons Learned	1. Importance of clear communication. 2. Need for flexibility in planning. 3. Value of regular team meetings.



<b>MATERIALS TESTING REPORT</b>		<b>U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE</b>		<b>DIRECT SHEAR TEST</b>	
PROJECT and STATE <u>WEPP Heiden Soil</u>			SAMPLE LOCATION <u>Waco, TX</u>		
FIELD SAMPLE NO	DEPTH	GEOLOGIC ORIGIN			
TYPE OF SAMPLE <u>COMPACTED</u>	TESTED AT <u>S.M.L., LINCOLN</u>	APPROVED BY		DATE	
CLASSIFICATION <u>CH</u>		LL <u>52</u> PI <u>37</u>		SPECIFIC GRAVITY	
TYPE OF TEST		CONTROL <u>STRAIN</u>		$G_s(-)^{\#4}$	<u>2.67</u>
RATE OF LOADING (in./min.) <u>0.00064</u>		MOISTURE CONDITION <u>FLOODED</u>		$G_s(+)^{\#4}$	
TYPE OF SPECIMEN <u>ROUND</u>	AREA (sq.in.) <u>4.9</u>	THICKNESS (in.) <u>1.0</u>		$G_m(bulk)(+)^{\#4}$	

TEST NO	1	2	3	4
INIT MOISTURE, %	<u>20.1</u>	<u>20.1</u>	<u>20.1</u>	
DRY DENSITY, $\frac{\text{g}}{\text{cc}}$ <input checked="" type="checkbox"/> $\frac{\text{pcf}}{\text{pcf}}$	<u>0.99</u>	<u>0.99</u>	<u>0.99</u>	
INIT VOID RATIO	<u>1.6970</u>	<u>1.6970</u>	<u>1.6970</u>	
TEST DURATION, min	<u>469</u>	<u>472</u>	<u>469</u>	
FINAL MOISTURE, %	<u>40.8</u>	<u>33.3</u>	<u>32.0</u>	
NORMAL STRESS $\text{psi}$	<u>2</u>	<u>4</u>	<u>6</u>	
MAX SHEAR STRESS $\text{psi}$	<u>0.9</u>	<u>2.5</u>	<u>3.9</u>	

SHEAR VALUES		$\phi$	$c$
AT MAXIMUM STRESS		<u><math>33^\circ</math></u>	<u>0</u>

DISPLACEMENT (%)

NORMAL STRESS ( $\sigma$ )  $\text{psi}$

REMARKS





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		DIRECT SHEAR TEST																																																	
PROJECT and STATE <u>WEPP</u> <u>Hirsh Soil</u>			SAMPLE LOCATION <u>Ord. NE</u>																																																		
FIELD SAMPLE NO	DEPTH	GEOLOGIC ORIGIN																																																			
TYPE OF SAMPLE <u>COMPACTED</u>	TESTED AT <u>S.M.L., LINCOLN</u>	APPROVED BY		DATE																																																	
CLASSIFICATION <u>Non-plastic SM</u>			LL	PI	SPECIFIC GRAVITY																																																
TYPE OF TEST <u>Consolidated Slow</u>			CONTROL <u>STRAIN</u>		$G_s(-)^{\#4}$ <u>2.63</u>																																																
RATE OF LOADING (in/min.) <u>0.0006</u>			MOISTURE CONDITION <u>FLOODED</u>		$G_s(+)^{\#4}$																																																
TYPE OF SPECIMEN <u>ROUND</u>		AREA(sq.in) <u>4.9</u>	THICKNESS (in.) <u>1.0</u>	$G_m(bulk)(+)^{\#4}$																																																	
<p>Graph 1: Shearing Stress (<math>\tau</math>) vs Displacement (%)</p> <table border="1"><caption>Approximate data for Graph 1</caption><thead><tr><th>Displacement (%)</th><th>Test (1) <math>\tau</math> (psi)</th><th>Test (2) <math>\tau</math> (psi)</th><th>Test (3) <math>\tau</math> (psi)</th></tr></thead><tbody><tr><td>0</td><td>0.5</td><td>0.8</td><td>1.2</td></tr><tr><td>2</td><td>0.8</td><td>1.2</td><td>1.8</td></tr><tr><td>4</td><td>1.0</td><td>1.6</td><td>2.5</td></tr><tr><td>6</td><td>1.1</td><td>1.8</td><td>2.8</td></tr><tr><td>8</td><td>1.1</td><td>1.8</td><td>3.0</td></tr><tr><td>10</td><td>1.1</td><td>1.8</td><td>3.2</td></tr></tbody></table>			Displacement (%)	Test (1) $\tau$ (psi)	Test (2) $\tau$ (psi)	Test (3) $\tau$ (psi)	0	0.5	0.8	1.2	2	0.8	1.2	1.8	4	1.0	1.6	2.5	6	1.1	1.8	2.8	8	1.1	1.8	3.0	10	1.1	1.8	3.2	TEST NO. 1 2 3 4																						
			Displacement (%)	Test (1) $\tau$ (psi)	Test (2) $\tau$ (psi)	Test (3) $\tau$ (psi)																																															
			0	0.5	0.8	1.2																																															
			2	0.8	1.2	1.8																																															
			4	1.0	1.6	2.5																																															
			6	1.1	1.8	2.8																																															
			8	1.1	1.8	3.0																																															
			10	1.1	1.8	3.2																																															
			INIT MOISTURE, %			2.65	2.65	2.65																																													
			DRY DENSITY, $\frac{g}{cc}$ $\frac{pcf}{\square}$			1.43	1.43	1.43																																													
INIT VOID RATIO			.8392	.8392	.8392																																																
TEST DURATION, (min)			500	488	458																																																
FINAL MOISTURE, %			18.6	18.0	16.6																																																
NORMAL STRESS $\psi$			2	4	6																																																
MAX SHEAR STRESS $\psi$			1.2	1.9	3.2																																																
SHEAR VALUES			$\phi$		c																																																
AT MAXIMUM STRESS			28°		0																																																
<p>Graph 2: Change in Thickness (%) vs Displacement (%)</p> <table border="1"><caption>Approximate data for Graph 2</caption><thead><tr><th>Displacement (%)</th><th>Test (1) Change (%)</th><th>Test (2) Change (%)</th><th>Test (3) Change (%)</th></tr></thead><tbody><tr><td>0</td><td>10</td><td>15</td><td>20</td></tr><tr><td>2</td><td>9</td><td>14</td><td>19</td></tr><tr><td>4</td><td>8</td><td>13</td><td>18</td></tr><tr><td>6</td><td>7</td><td>12</td><td>17</td></tr><tr><td>8</td><td>6</td><td>11</td><td>16</td></tr><tr><td>10</td><td>5</td><td>10</td><td>15</td></tr></tbody></table>			Displacement (%)	Test (1) Change (%)	Test (2) Change (%)	Test (3) Change (%)	0	10	15	20	2	9	14	19	4	8	13	18	6	7	12	17	8	6	11	16	10	5	10	15	<p>Graph 3: Shearing Stress (<math>\tau</math>) vs Normal Stress (<math>\sigma</math>)</p> <table border="1"><caption>Approximate data for Graph 3</caption><thead><tr><th>Normal Stress (<math>\sigma</math>) (psi)</th><th>Test (1) <math>\tau</math> (psi)</th><th>Test (2) <math>\tau</math> (psi)</th><th>Test (3) <math>\tau</math> (psi)</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>2</td><td>1.2</td><td>1.9</td><td>3.2</td></tr><tr><td>4</td><td>2.4</td><td>3.8</td><td>6.4</td></tr><tr><td>6</td><td>3.6</td><td>5.7</td><td>9.6</td></tr></tbody></table>			Normal Stress ( $\sigma$ ) (psi)	Test (1) $\tau$ (psi)	Test (2) $\tau$ (psi)	Test (3) $\tau$ (psi)	0	0	0	0	2	1.2	1.9	3.2	4	2.4	3.8	6.4	6	3.6	5.7	9.6
			Displacement (%)	Test (1) Change (%)	Test (2) Change (%)	Test (3) Change (%)																																															
			0	10	15	20																																															
			2	9	14	19																																															
			4	8	13	18																																															
			6	7	12	17																																															
			8	6	11	16																																															
			10	5	10	15																																															
			Normal Stress ( $\sigma$ ) (psi)	Test (1) $\tau$ (psi)	Test (2) $\tau$ (psi)	Test (3) $\tau$ (psi)																																															
			0	0	0	0																																															
2	1.2	1.9	3.2																																																		
4	2.4	3.8	6.4																																																		
6	3.6	5.7	9.6																																																		
REMARKS																																																					





MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	DIRECT SHEAR TEST
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PROJECT and STATE <u>WEPP Keith Soil</u>	SAMPLE LOCATION <u>Albin, WY</u>
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FIELD SAMPLE NO.	DEPTH	GEOLOGIC ORIGIN
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TYPE OF SAMPLE <u>COMPACTED</u>	TESTED AT <u>S.M.L., LINCOLN</u>	APPROVED BY	DATE
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CLASSIFICATION <u>CL</u>	LL <u>32</u> PI <u>13</u>	SPECIFIC GRAVITY
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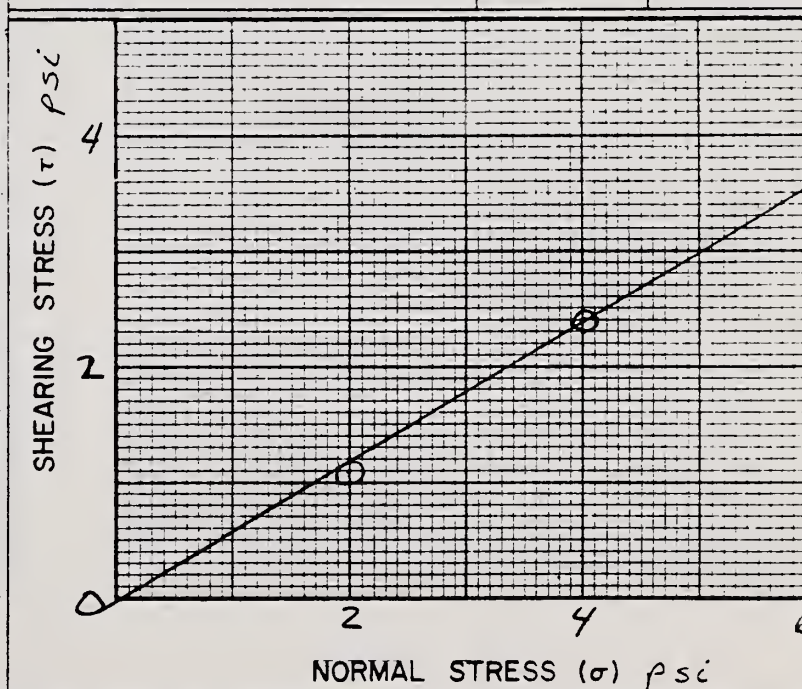
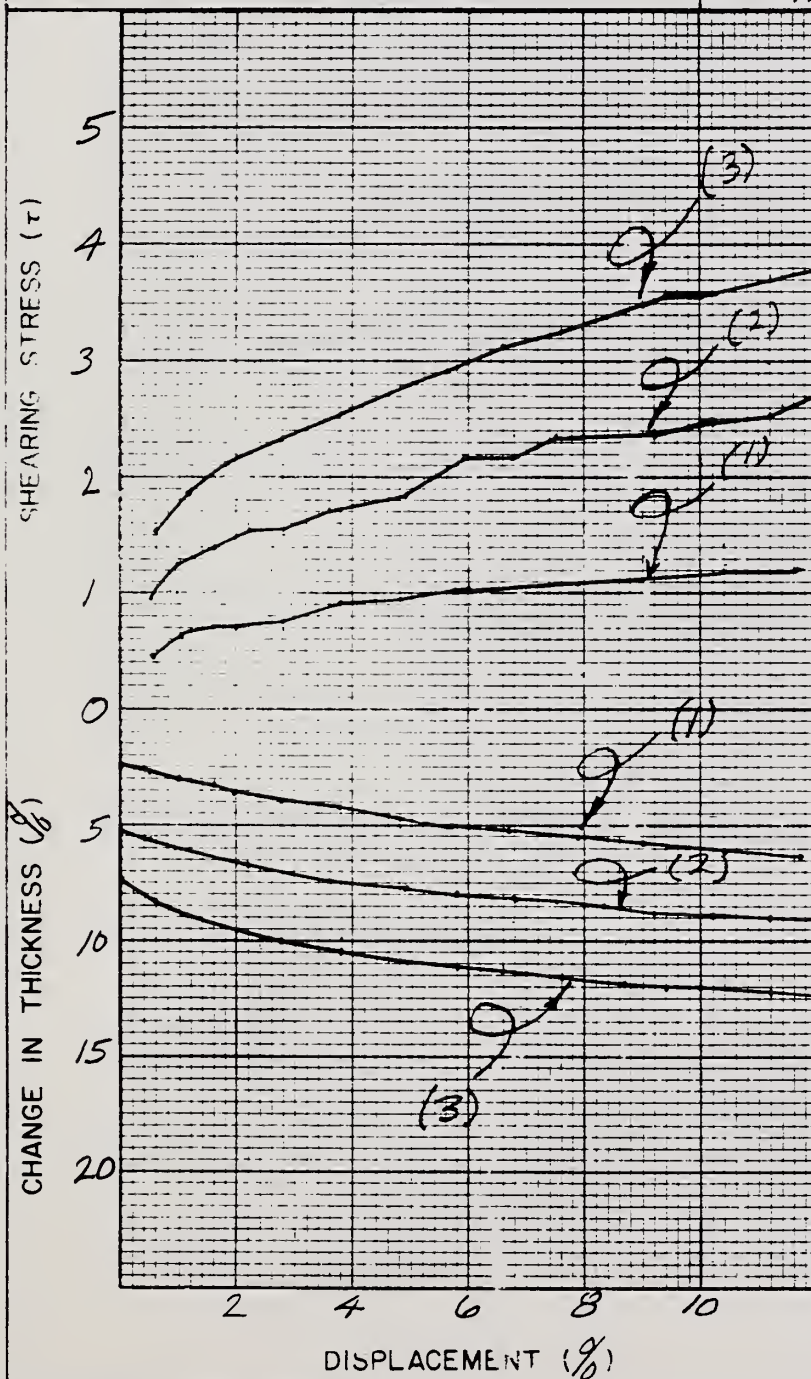
TYPE OF TEST <u>Consolidated Slow</u>	CONTROL <u>STRAIN</u>	$G_s(-)^{\#4}$ <u>2.50</u>
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RATE OF LOADING (in/min.) <u>0.00064</u>	MOISTURE CONDITION <u>FLOODED</u>	$G_s(+)^{\#4}$
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TYPE OF SPECIMEN <u>ROUND</u>	AREA (sq. in.) <u>4.9</u>	THICKNESS (in.) <u>1.0</u>	$G_m(bulk)(+)^{\#4}$
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TEST NO.	1	2	3	4
INIT MOISTURE, %	14.4	14.4	14.4	
DRY DENSITY, $\frac{g}{cc}$ $\frac{pc}{ft}$	1.32	1.32	1.32	
INIT. VOID RATIO	.9621	.9621	.9621	
TEST DURATION, (min.)	456	469	469	
FINAL MOISTURE, %	29.8	26.5	25.0	
NORMAL STRESS, psi	2	4	6	
MAX SHEAR STRESS, psi	1.1	2.4	3.6	

SHEAR VALUES	$\phi$	c
AT MAXIMUM STRESS	31°	0



REMARKS





<b>MATERIALS TESTING REPORT</b>		<b>U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE</b>		<b>DIRECT SHEAR TEST</b>	
PROJECT and STATE <u>WEPP Los Banos Soil</u>			SAMPLE LOCATION <u>Fresno, CA</u>		
FIELD SAMPLE NO		DEPTH		GEOLOGIC ORIGIN	
TYPE OF SAMPLE <u>COMPACTED</u>		TESTED AT <u>S.M.L., LINCOLN</u>		APPROVED BY	
CLASSIFICATION <u>CL</u>		LL <u>46</u> PI <u>25</u>		SPECIFIC GRAVITY	
TYPE OF TEST <u>Consolidated Slow</u>		CONTROL <u>STRAIN</u>		$G_s(-)^{\#4}$ <u>2.61</u>	
RATE OF LOADING (in/min.) <u>0.0006</u>		MOISTURE CONDITION <u>FLOODED</u>		$G_s(+)^{\#4}$	
TYPE OF SPECIMEN <u>ROUND</u>		AREA (sq in.) <u>4.9</u>		THICKNESS (in.) <u>1.0</u>	
				$G_m(bulk)(+)^{\#4}$	

**SHEARING STRESS ( $\tau$ )**

**CHANGE IN THICKNESS (%)**

**DISPLACEMENT (%)**

TEST NO.	1	2	3	4
INIT MOISTURE, %	15.9	15.9	15.9	
DRY DENSITY, $\frac{g}{cc}$ $\frac{pcf}{}$	1.01	1.01	1.01	
INIT VOID RATIO	1.5842	1.5842	1.5842	
TEST DURATION, (min)	483	467	490	
FINAL MOISTURE, %	38.4	35.1	32.0	
NORMAL STRESS $\psi$	2	4	6	
MAX. SHEAR STRESS $\psi$	1.4	2.6	3.6	

SHEAR VALUES		$\phi$	c
AT MAXIMUM STRESS		30°	40 psh

REMARKS





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		DIRECT SHEAR TEST						
PROJECT and STATE <u>WEPP Pierre Soil</u>			SAMPLE LOCATION <u>Jottonwood SC</u>							
FIELD SAMPLE NO.	DEPTH	GEOLOGIC ORIGIN								
TYPE OF SAMPLE <u>COMPACTED</u>	TESTED AT <u>S.M.L., LINCOLN</u>	APPROVED BY		DATE						
CLASSIFICATION <u>CH</u>			LL <u>52</u> PI <u>32</u>		SPECIFIC GRAVITY					
TYPE OF TEST <u>Consolidated Slow</u>			CONTROL <u>STRAIN</u>		$G_s(-)^{*4}$ <u>2.71</u>					
RATE OF LOADING (in/min) <u>0.00064</u>			MOISTURE CONDITION <u>FLOODED</u>		$G_s(+)^{*4}$					
TYPE OF SPECIMEN <u>ROUND</u>		AREA (sq.in) <u>4.9</u>	THICKNESS (in) <u>1.0</u>		$G_m(bulk)(+)^{*4}$					
			TEST NO.				1	2	3	4
			INIT MOISTURE, %				16.4	16.4	16.4	
			DRY DENSITY, $\frac{g}{cc}$ $\frac{pcf}{}$				1.05	1.05	1.05	
			INIT VOID RATIO				1.5810	1.5810	1.5810	
			TEST DURATION, (min)				453	464	469	
			FINAL MOISTURE, %				42.2	38.1	35.6	
			NORMAL STRESS $psi$				2	4	6	
			MAX. SHEAR STRESS $psi$				1.2	2.3	3.8	
			SHEAR VALUES				$\phi$		C	
			AT MAXIMUM STRESS				32°		0	
			SHEARING STRESS ( $\tau$ ) $psi$				NORMAL STRESS ( $\sigma$ ) $psi$			
REMARKS										





MATERIALS TESTING REPORT

U. S. DEPARTMENT of AGRICULTURE  
SOIL CONSERVATION SERVICE

DIRECT SHEAR TEST

PROJECT and STATE  
WEPP Palouse So. 1

SAMPLE LOCATION  
Pullman, NF

FIELD SAMPLE NO

DEPTH

GEOLOGIC ORIGIN

TYPE OF SAMPLE  
COMPACTED

TESTED AT  
S.M.L., LINCOLN

APPROVED BY

DATE

CLASSIFICATION  
CL

LL 31 PI 13

SPECIFIC GRAVITY

TYPE OF TEST  
Consolidated Slow

CONTROL STRAIN

G<sub>s</sub>(-) #4  
2.64

RATE OF LOADING (in./min.)  
0.00064

MOISTURE CONDITION  
FLOODED

G<sub>s</sub>(+) #4

TYPE OF SPECIMEN  
ROUND

AREA(sq.in)  
4.9

THICKNESS(in)  
1.0

G<sub>m</sub>(bulk)(+) #4

5

4

3

2

1

0

5

10

15

20

DISPLACEMENT (%)

(3)

(2)

(1)

(1)

(2)

(3)

TEST NO.

1

2

3

4

INIT. MOISTURE, %

14.2

14.2

14.2

DRY DENSITY, 

g/cc

pcf

1.15

1.15

1.15

INIT VOID RATIO

1.2956

1.2956

1.2956

TEST DURATION, (min)

438

469

469

FINAL MOISTURE, %

30.8

29.8

29.6

NORMAL STRESS

psi

2

4

6

MAX. SHEAR STRESS

psi

1.4

2.6

3.8

SHEAR VALUES

φ

c

AT MAXIMUM STRESS

31°

25psi

SHEARING STRESS (τ) psi

4

2

0

2

4

6

NORMAL STRESS (σ) psi

REMARKS





<b>MATERIALS TESTING REPORT</b>	U. S. DEPARTMENT of AGRICULTURE <b>SOIL CONSERVATION SERVICE</b>	<b>DIRECT SHEAR TEST</b>
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PROJECT and STATE <u>WEPP Portneuf Soil</u>	SAMPLE LOCATION <u>Kimberly, ID</u>
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FIELD SAMPLE NO	DEPTH	GEOLOGIC ORIGIN
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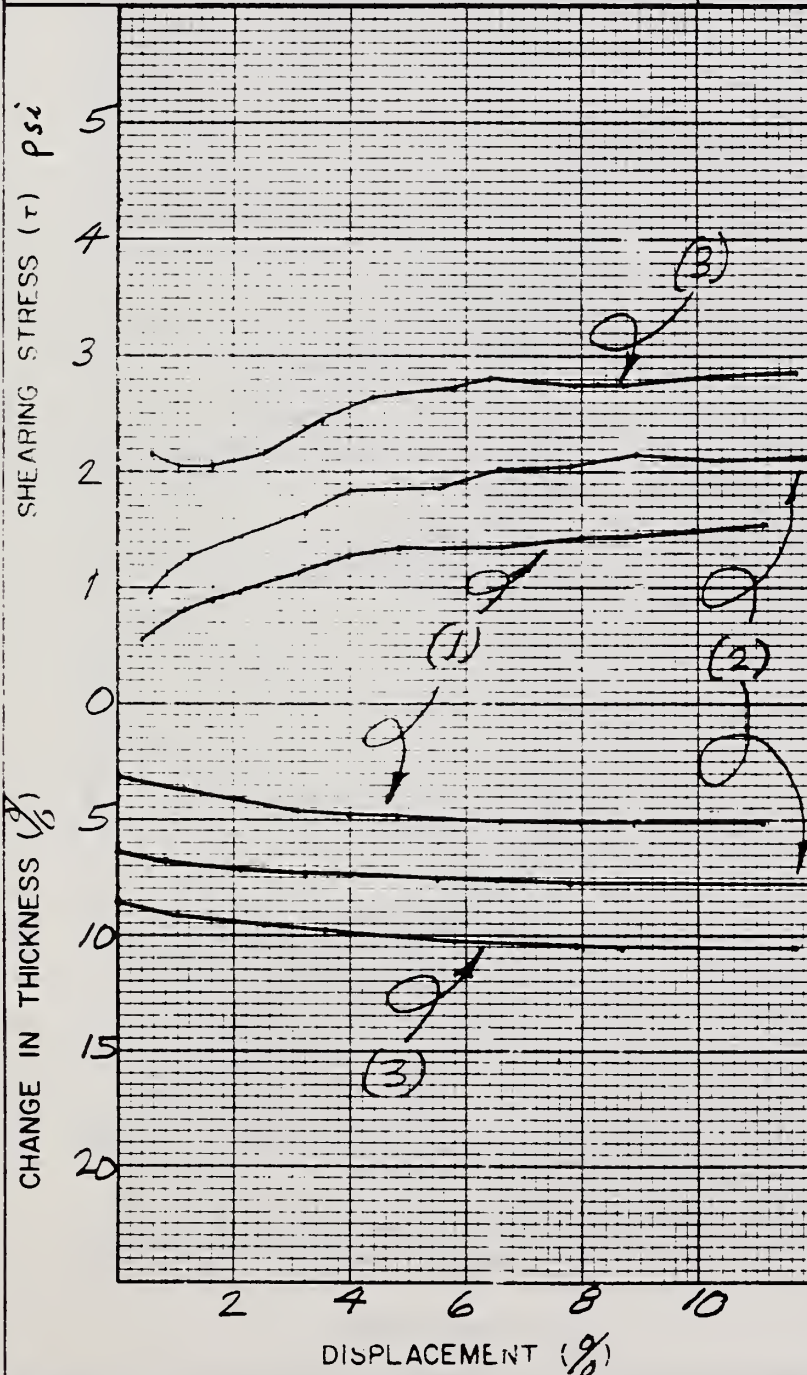
TYPE OF SAMPLE <u>COMPACTED</u>	TESTED AT <u>S.M.L., LINCOLN</u>	APPROVED BY	DATE
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CLASSIFICATION <u>CL-ML</u>	LL <u>28</u> PI <u>4</u>	SPECIFIC GRAVITY
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TYPE OF TEST <u>Consolidated Slow</u>	CONTROL <u>STRAIN</u>	G <sub>s</sub> (-) #4	2.66
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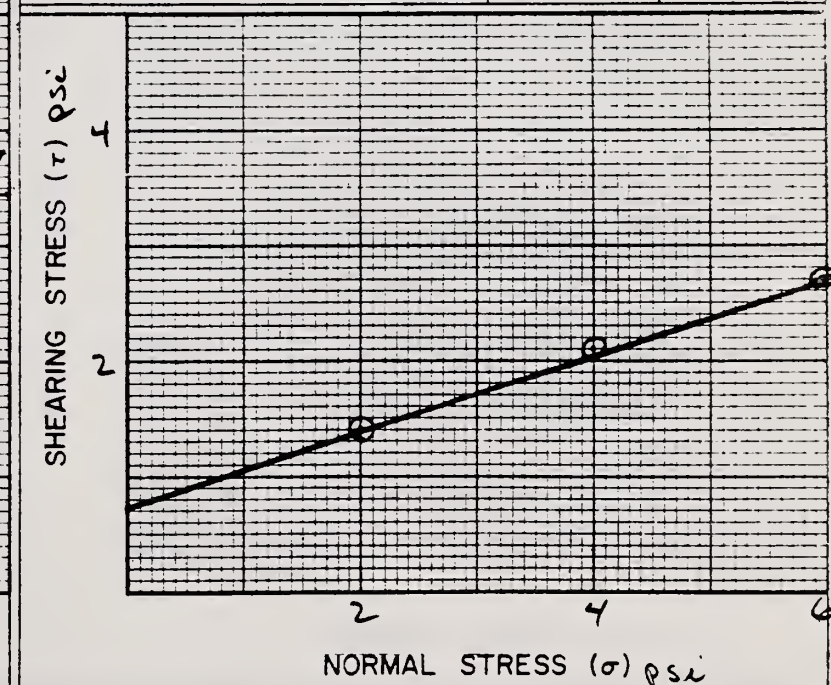
RATE OF LOADING (in./min.) <u>0.0006</u>	MOISTURE CONDITION <u>FLOODED</u>	G <sub>s</sub> (+) #4	
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TYPE OF SPECIMEN <u>ROUND</u>	AREA (sq.in.) <u>4.9</u>	THICKNESS (in.) <u>1.0</u>	G <sub>m</sub> (bulk)(+) #4
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TEST NO	1	2	3	4
INIT MOISTURE, %	15.8	15.8	15.8	
DRY DENSITY, $\frac{g}{cc}$ <input checked="" type="checkbox"/> or $\frac{pcf}{in^3}$ <input type="checkbox"/>	1.25	1.25	1.25	
INIT VOID RATIO	1.1280	1.1280	1.1280	
TEST DURATION, (min)	463	500	498	
FINAL MOISTURE, %	34.0	31.3	33.4	
NORMAL STRESS psi	2	4	6	
MAX SHEAR STRESS psi	1.4	2.1	2.7	

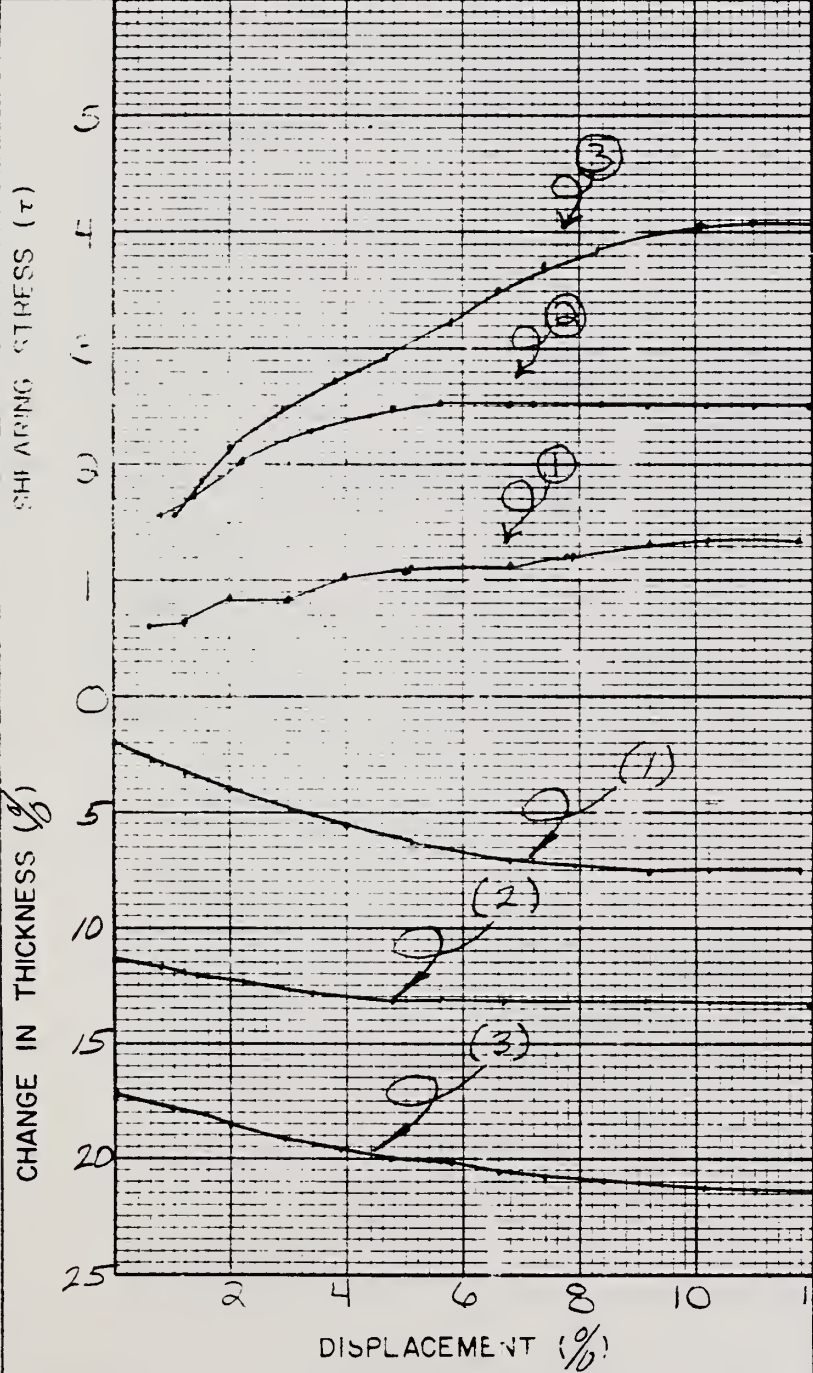
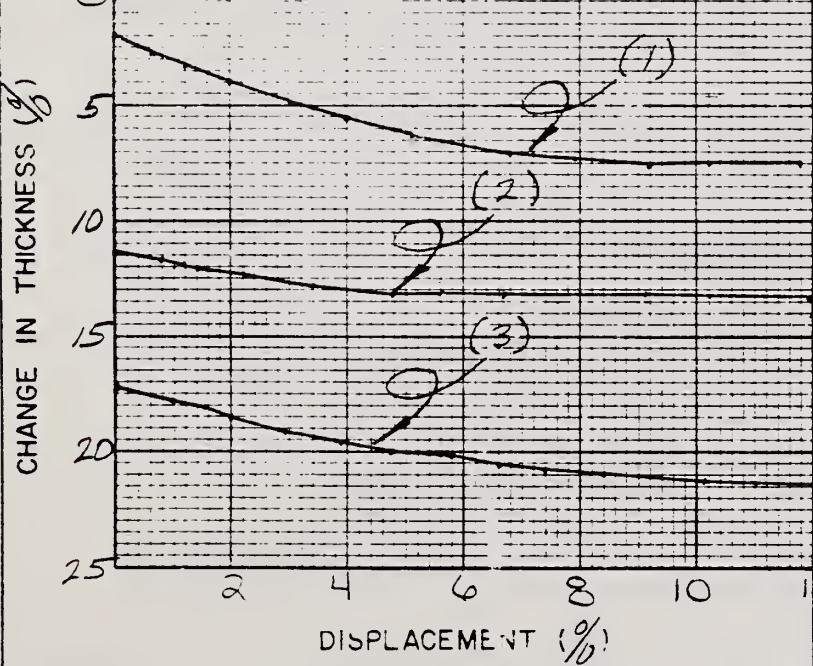
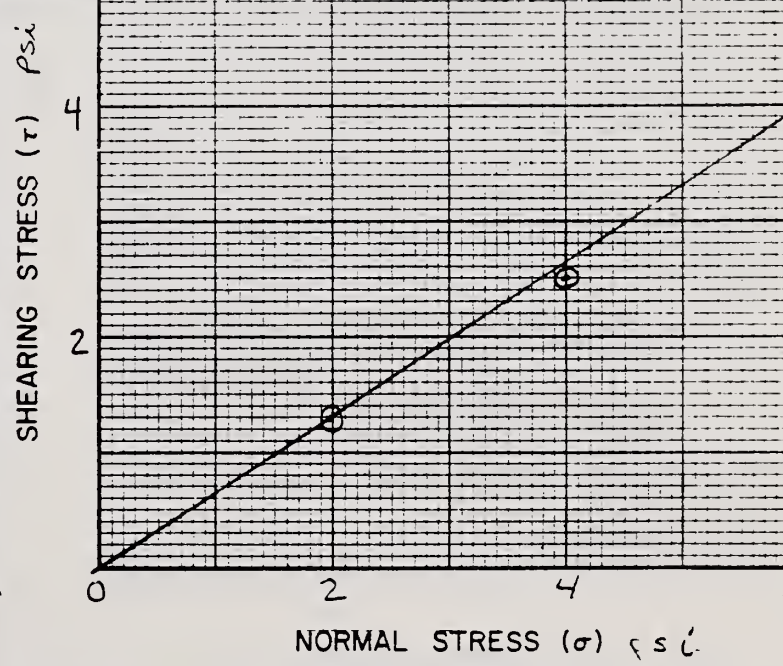
SHEAR VALUES	$\phi$	c
AT MAXIMUM STRESS	18°	100



REMARKS





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		DIRECT SHEAR TEST				
PROJECT and STATE <u>WEPP Sharpsburg Soil</u>			SAMPLE LOCATION <u>Lincoln NE</u>					
FIELD SAMPLE NO	DEPT-	GEOLOGIC ORIGIN						
TYPE OF SAMPLE <u>Composted</u>	TESTED AT <u>S.M. L., Lincoln</u>	APPROVED BY		DATE				
CLASSIFICATION <u>CL</u>			LL <u>49</u> PI <u>30</u>		SPECIFIC GRAVITY			
TYPE OF TEST <u>Consolidated Slow</u>			CONTROL <u>Strain</u>		$G_s(-)^{\#4}$ <u>2.63</u>			
RATE OF LOADING (in/min.) <u>0.00064</u>			MOISTURE CONDITION <u>Flooded</u>		$G_s(+)^{\#4}$			
TYPE OF SPECIMEN <u>Remold</u>		AREA (sq. in.) <u>4.9</u>	THICKNESS (in.) <u>1.0</u>		$G_m(bulk)(+)^{\#4}$			
			TEST NO		1	2	3	4
			INIT MOISTURE, %		19.3	19.3	19.3	
			DRY DENSITY, $\frac{g}{cc}$		1.14	1.14	1.14	
			INIT VOID RATIO		1.3070	1.3070	1.3070	
			TEST DURATION, (min)		462	469	477	
			FINAL MOISTURE, %		25.26	25.02	25.71	
			NORMAL STRESS $p_{sa}$		2	-	6	
			MAX SHEAR STRESS $f_{sa}$		1.3	2.5	4.0	
			SHEAR VALUES		$\phi$		c	
			AT MAXIMUM STRESS		34°		0	
								
			SHEARING STRESS ( $\tau$ ) psi					
DISPLACEMENT (%)				NORMAL STRESS ( $\sigma$ ) psi				
REMARKS								





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		DIRECT SHEAR TEST																																																																					
PROJECT and STATE WEPP Sverdrup Soil			SAMPLE LOCATION Morris, MN																																																																						
FIELD SAMPLE NO.	DEPTH	GEOLOGIC ORIGIN																																																																							
TYPE OF SAMPLE Composted	TESTED AT S. M. L. Lincoln	APPROVED BY		DATE																																																																					
CLASSIFICATION SC		LL 25 PI 9		SPECIFIC GRAVITY																																																																					
TYPE OF TEST Consolidated Slow		CONTROL Strain		$G_s(-)^{\#4}$	2.63																																																																				
RATE OF LOADING (in./min.) 0.0006		MOISTURE CONDITION Flooded		$G_s(+)^{\#4}$																																																																					
TYPE OF SPECIMEN Round	AREA (sq. in.) 4.9	THICKNESS (in.) 1.0		$G_m(bulk)(+)^{\#4}$																																																																					
<p>Graph 1: Shearing Stress (tau) vs Displacement (%)</p> <table border="1"><caption>Approximate data for Graph 1</caption><thead><tr><th>Displacement (%)</th><th>tau (psi) (1)</th><th>tau (psi) (2)</th><th>tau (psi) (3)</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>2</td><td>2.0</td><td>1.5</td><td>1.0</td></tr><tr><td>4</td><td>3.0</td><td>2.0</td><td>1.2</td></tr><tr><td>6</td><td>3.2</td><td>2.2</td><td>1.3</td></tr><tr><td>8</td><td>3.5</td><td>2.3</td><td>1.4</td></tr><tr><td>10</td><td>3.2</td><td>2.2</td><td>1.3</td></tr></tbody></table>		Displacement (%)	tau (psi) (1)	tau (psi) (2)	tau (psi) (3)	0	0	0	0	2	2.0	1.5	1.0	4	3.0	2.0	1.2	6	3.2	2.2	1.3	8	3.5	2.3	1.4	10	3.2	2.2	1.3	<table border="1"><thead><tr><th>TEST NO</th><th>1</th><th>2</th><th>3</th><th>4</th></tr></thead><tbody><tr><td>INIT MOISTURE, %</td><td>10.21</td><td>10.21</td><td>10.21</td><td></td></tr><tr><td>DRY DENSITY, <math>\frac{g}{cc}</math> <input checked="" type="checkbox"/> <math>\frac{g}{cc}</math> <input type="checkbox"/> <math>\frac{pcf}{pcf}</math></td><td>1.46</td><td>1.46</td><td>1.46</td><td></td></tr><tr><td>INIT VOID RATIO</td><td>.8014</td><td>.8014</td><td>.8014</td><td></td></tr><tr><td>TEST DURATION, (min)</td><td>483</td><td>453</td><td>433</td><td></td></tr><tr><td>FINAL MOISTURE, %</td><td>20.3</td><td>20.3</td><td>18.21</td><td></td></tr><tr><td>NORMAL STRESS <math>p_{sA}</math></td><td>2</td><td>-</td><td>6</td><td></td></tr><tr><td>MAX SHEAR STRESS <math>p_{sA}</math></td><td>1.0</td><td>2.1</td><td>2.8</td><td></td></tr></tbody></table>				TEST NO	1	2	3	4	INIT MOISTURE, %	10.21	10.21	10.21		DRY DENSITY, $\frac{g}{cc}$ <input checked="" type="checkbox"/> $\frac{g}{cc}$ <input type="checkbox"/> $\frac{pcf}{pcf}$	1.46	1.46	1.46		INIT VOID RATIO	.8014	.8014	.8014		TEST DURATION, (min)	483	453	433		FINAL MOISTURE, %	20.3	20.3	18.21		NORMAL STRESS $p_{sA}$	2	-	6		MAX SHEAR STRESS $p_{sA}$	1.0	2.1	2.8	
		Displacement (%)	tau (psi) (1)	tau (psi) (2)	tau (psi) (3)																																																																				
		0	0	0	0																																																																				
		2	2.0	1.5	1.0																																																																				
		4	3.0	2.0	1.2																																																																				
		6	3.2	2.2	1.3																																																																				
		8	3.5	2.3	1.4																																																																				
		10	3.2	2.2	1.3																																																																				
		TEST NO	1	2	3	4																																																																			
		INIT MOISTURE, %	10.21	10.21	10.21																																																																				
DRY DENSITY, $\frac{g}{cc}$ <input checked="" type="checkbox"/> $\frac{g}{cc}$ <input type="checkbox"/> $\frac{pcf}{pcf}$	1.46	1.46	1.46																																																																						
INIT VOID RATIO	.8014	.8014	.8014																																																																						
TEST DURATION, (min)	483	453	433																																																																						
FINAL MOISTURE, %	20.3	20.3	18.21																																																																						
NORMAL STRESS $p_{sA}$	2	-	6																																																																						
MAX SHEAR STRESS $p_{sA}$	1.0	2.1	2.8																																																																						
SHEAR VALUES				$\phi$	$c$																																																																				
AT MAXIMUM STRESS				27°	0																																																																				
<p>Graph 2: Change in Thickness (%) vs Displacement (%)</p> <table border="1"><caption>Approximate data for Graph 2</caption><thead><tr><th>Displacement (%)</th><th>Change in Thickness (%) (1)</th><th>Change in Thickness (%) (2)</th><th>Change in Thickness (%) (3)</th></tr></thead><tbody><tr><td>0</td><td>5</td><td>10</td><td>15</td></tr><tr><td>2</td><td>7</td><td>12</td><td>17</td></tr><tr><td>4</td><td>8</td><td>13</td><td>18</td></tr><tr><td>6</td><td>9</td><td>14</td><td>19</td></tr><tr><td>8</td><td>10</td><td>15</td><td>20</td></tr><tr><td>10</td><td>10</td><td>15</td><td>20</td></tr></tbody></table>		Displacement (%)	Change in Thickness (%) (1)	Change in Thickness (%) (2)	Change in Thickness (%) (3)	0	5	10	15	2	7	12	17	4	8	13	18	6	9	14	19	8	10	15	20	10	10	15	20	<p>Graph 3: Shearing Stress (tau) vs Normal Stress (sigma) psc</p> <table border="1"><caption>Data points for Graph 3</caption><thead><tr><th>Normal Stress (sigma) psc</th><th>Shearing Stress (tau) psc</th></tr></thead><tbody><tr><td>2</td><td>1.0</td></tr><tr><td>4</td><td>2.1</td></tr><tr><td>6</td><td>2.8</td></tr></tbody></table>				Normal Stress (sigma) psc	Shearing Stress (tau) psc	2	1.0	4	2.1	6	2.8																																
		Displacement (%)	Change in Thickness (%) (1)	Change in Thickness (%) (2)	Change in Thickness (%) (3)																																																																				
0	5	10	15																																																																						
2	7	12	17																																																																						
4	8	13	18																																																																						
6	9	14	19																																																																						
8	10	15	20																																																																						
10	10	15	20																																																																						
Normal Stress (sigma) psc	Shearing Stress (tau) psc																																																																								
2	1.0																																																																								
4	2.1																																																																								
6	2.8																																																																								
REMARKS																																																																									





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		DIRECT SHEAR TEST			
PROJECT and STATE <u>WEPP Walla Walla Soil</u>			SAMPLE LOCATION <u>Fuller NE</u>				
FIELD SAMPLE NO.	DEPTH	GEOLOGIC ORIGIN					
TYPE OF SAMPLE <u>Compacted</u>	TESTED AT <u>St. Paul, Minn</u>	APPROVED BY		DATE			
CLASSIFICATION <u>CL-ML</u>		LL <u>28</u> PI <u>4</u>		SPECIFIC GRAVITY			
TYPE OF TEST <u>Consolidated Slow</u>		CONTROL <u>Strain</u>		$G_s(-)^{\#4}$	<u>2.65</u>		
RATE OF LOADING (in/min) <u>0.00064</u>		MOISTURE CONDITION <u>Flooded</u>		$G_s(+)^{\#4}$			
TYPE OF SPECIMEN <u>Round</u>	AREA (sq.in.) <u>4.9</u>	THICKNESS (in.) <u>1.0</u>		$G_m(bulk)(+)^{\#4}$			
		TEST NO	1	2	3	4	
		INIT MOISTURE, %	13.61	13.61	13.61		
		DRY DENSITY, $\frac{g}{cc}$ <input checked="" type="checkbox"/> $\frac{g}{cc}$ <input type="checkbox"/> $\frac{pc}{ft^3}$	1.25	1.25	1.25		
		INIT VOID RATIO	1.1200	1.1200	1.1200		
		TEST DURATION, (min)	469	469	461		
		FINAL MOISTURE, %	34.01	33.85	33.95		
		NORMAL STRESS psi	2	-	6		
		MAX. SHEAR STRESS psi	1.2	2.2	3.0		
		SHEAR VALUES		$\phi$		c	
		AT MAXIMUM STRESS		30°		0	
		SHEARING STRESS (tau) psi					
		NORMAL STRESS (sigma) psi					
REMARKS							





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		DIRECT SHEAR TEST					
PROJECT and STATE WEPP Whitney Soil			SAMPLE LOCATION Fresno, CA						
FIELD SAMPLE NO.		DEPTH	GEOLOGIC ORIGIN						
TYPE OF SAMPLE Compacted		TESTED AT S. M. L. Lincoln		APPROVED BY					
CLASSIFICATION Non-plastic SM		LL		PI					
TYPE OF TEST Consolidated Slow		CONTROL Strain		SPECIFIC GRAVITY $G_s(-)^{\#4}$ 2.67					
RATE OF LOADING (in/min.) 0.00064		MOISTURE CONDITION Flooded		$G_s(+)^{\#4}$					
TYPE OF SPECIMEN Round		AREA (sq.in) 4.9		THICKNESS (in) 1.0					
				$G_m(bulk)(+)^{\#4}$					
				TEST NO.		1	2	3	4
				INIT MOISTURE, %		7.34	7.34	7.34	
				DRY DENSITY, $\frac{g}{cc}$ $\frac{pcf}{pcf}$		1.54	1.54	1.54	
				INIT VOID RATIO		.7333	.7333	.7333	
				TEST DURATION, (min)		463	463	463	
				FINAL MOISTURE, %		15.2	16.3	15.5	
				NORMAL STRESS $psf$		2	4	6	
				MAX SHEAR STRESS $psf$		1.3	2.5	3.5	
SHEAR VALUES				$\phi$		$c$			
AT MAXIMUM STRESS				31°		0			
								REMARKS	





<b>MATERIALS TESTING REPORT</b>		<b>U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE</b>		<b>DIRECT SHEAR TEST</b>	
PROJECT and STATE <span style="font-size: 1.2em;">WEPP Williams Soil</span>			SAMPLE LOCATION <span style="font-size: 1.2em;">McClusky ND</span>		
FIELD SAMPLE NO.	DEPTH	GEOLOGIC ORIGIN			
TYPE OF SAMPLE <span style="font-size: 1.2em;">COMPACTED</span>	TESTED AT <span style="font-size: 1.2em;">S.M.L., LINCOLN</span>		APPROVED BY		DATE
CLASSIFICATION _____ LL _____ PI _____				SPECIFIC GRAVITY	
TYPE OF TEST <span style="font-size: 1.2em;">Consolidated Slow</span>			CONTROL STRAIN		
RATE OF LOADING (in./min.) <span style="font-size: 1.2em;">0.00064</span>			MOISTURE CONDITION <span style="font-size: 1.2em;">FLOODED</span>		
TYPE OF SPECIMEN <span style="font-size: 1.2em;">ROUND</span>		AREA(sq.in) <span style="font-size: 1.2em;">4.9</span>		THICKNESS(in) <span style="font-size: 1.2em;">1.0</span>	
				$G_s(-)^{\#}4$ <span style="font-size: 1.2em;">2.59</span>	
				$G_s(+)^{\#}4$	
				$G_m(bulk)(+)^{\#}4$	
TEST NO.	1	2	3	4	
INIT MOISTURE, %	16.78	16.78	16.78		
DRY DENSITY, $\frac{g}{cc}$ or $\frac{lb}{ft^3}$	1.16	1.16	1.16		
INIT VOID RATIO	1.2328	1.2328	1.2328		
TEST DURATION, min	469	469	469		
FINAL MOISTURE, %	28.87	27.27	24.88		
NORMAL STRESS psi	2	4	6		
MAX. SHEAR STRESS psi	1.2	2.3	3.6		
SHEAR VALUES	$\phi^\circ$	$c_{psf}$			
AT MAXIMUM STRESS	31°	0			
REMARKS					





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		DIRECT SHEAR TEST																																																			
PROJECT and STATE <u>WEPP Woodward Soil</u>			SAMPLE LOCATION <u>Oklahoma</u>																																																				
FIELD SAMPLE NO		DEPTH	GEOLOGIC ORIGIN																																																				
TYPE OF SAMPLE <u>COMPACTED</u>		TESTED AT <u>S.M.L., LINCOLN</u>	APPROVED BY		DATE																																																		
CLASSIFICATION <u>CL-ML</u>				LL <u>25</u> PI <u>7</u>	SPECIFIC GRAVITY																																																		
TYPE OF TEST <u>Consolidated Slow</u>				CONTROL STRAIN	$G_s(-)^{\#4}$ <u>2.61</u>																																																		
RATE OF LOADING (in/min.) <u>0.00064</u>				MOISTURE CONDITION <u>FLOODED</u>	$G_s(+)^{\#4}$																																																		
TYPE OF SPECIMEN <u>ROUND</u>		AREA (sq.in.) <u>4.9</u>	THICKNESS (in.) <u>1.0</u>	$G_m(bulk)(+)^{\#4}$																																																			
<div style="display: flex; justify-content: space-between;"><div style="width: 50%;"><p style="text-align: center;">SHEARING STRESS (<math>\tau</math>)</p><p style="text-align: center;">CHANGE IN THICKNESS (%)</p><p style="text-align: center;">DISPLACEMENT (%)</p></div><div style="width: 45%;"><table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th>TEST NO.</th><th>1</th><th>2</th><th>3</th><th>4</th></tr></thead><tbody><tr><td>INIT MOISTURE, %</td><td><u>8.39</u></td><td><u>8.39</u></td><td><u>8.39</u></td><td></td></tr><tr><td>DRY DENSITY, <math>\frac{g}{cc}</math> / <math>\frac{pcf}{}</math></td><td><u>1.41</u></td><td><u>1.41</u></td><td><u>1.41</u></td><td></td></tr><tr><td>INIT VOID RATIO</td><td><u>.8511</u></td><td><u>.8511</u></td><td><u>.8511</u></td><td></td></tr><tr><td>TEST DURATION, (min)</td><td><u>469</u></td><td><u>444</u></td><td><u>469</u></td><td></td></tr><tr><td>FINAL MOISTURE, %</td><td><u>24.8</u></td><td><u>23.5</u></td><td><u>22.3</u></td><td></td></tr><tr><td>NORMAL STRESS <math>psi</math></td><td><u>2</u></td><td><u>4</u></td><td><u>6</u></td><td></td></tr><tr><td>MAX SHEAR STRESS <math>psi</math></td><td><u>1.1</u></td><td><u>2.3</u></td><td><u>3.4</u></td><td></td></tr><tr><td colspan="2" style="text-align: center;">SHEAR VALUES</td><td><math>\phi</math></td><td><math>c</math></td><td></td></tr><tr><td colspan="2" style="text-align: center;">AT MAXIMUM STRESS</td><td><u>30°</u></td><td><u>0</u></td><td></td></tr></tbody></table><div style="margin-top: 10px;"><p style="text-align: center;">SHEARING STRESS (<math>\tau</math>) <math>psi</math></p><p style="text-align: center;">NORMAL STRESS (<math>\sigma</math>) <math>psi</math></p></div></div></div>						TEST NO.	1	2	3	4	INIT MOISTURE, %	<u>8.39</u>	<u>8.39</u>	<u>8.39</u>		DRY DENSITY, $\frac{g}{cc}$ / $\frac{pcf}{}$	<u>1.41</u>	<u>1.41</u>	<u>1.41</u>		INIT VOID RATIO	<u>.8511</u>	<u>.8511</u>	<u>.8511</u>		TEST DURATION, (min)	<u>469</u>	<u>444</u>	<u>469</u>		FINAL MOISTURE, %	<u>24.8</u>	<u>23.5</u>	<u>22.3</u>		NORMAL STRESS $psi$	<u>2</u>	<u>4</u>	<u>6</u>		MAX SHEAR STRESS $psi$	<u>1.1</u>	<u>2.3</u>	<u>3.4</u>		SHEAR VALUES		$\phi$	$c$		AT MAXIMUM STRESS		<u>30°</u>	<u>0</u>	
TEST NO.	1	2	3	4																																																			
INIT MOISTURE, %	<u>8.39</u>	<u>8.39</u>	<u>8.39</u>																																																				
DRY DENSITY, $\frac{g}{cc}$ / $\frac{pcf}{}$	<u>1.41</u>	<u>1.41</u>	<u>1.41</u>																																																				
INIT VOID RATIO	<u>.8511</u>	<u>.8511</u>	<u>.8511</u>																																																				
TEST DURATION, (min)	<u>469</u>	<u>444</u>	<u>469</u>																																																				
FINAL MOISTURE, %	<u>24.8</u>	<u>23.5</u>	<u>22.3</u>																																																				
NORMAL STRESS $psi$	<u>2</u>	<u>4</u>	<u>6</u>																																																				
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SHEAR VALUES		$\phi$	$c$																																																				
AT MAXIMUM STRESS		<u>30°</u>	<u>0</u>																																																				
REMARKS																																																							





MATERIALS TESTING REPORT		U.S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		DIRECT SHEAR TEST			
PROJECT and STATE WEPP		Zahl Soil		SAMPLE LOCATION ND			
FIELD SAMPLE NO	DEPTH	GEOLOGIC ORIGIN					
TYPE OF SAMPLE COMPACTED	TESTED AT S.M.L., LINCOLN	APPROVED BY		DATE			
CLASSIFICATION		LL		PI			
TYPE OF TEST Consolidated Slow		CONTROL STRAIN		G <sub>s</sub> (-) #4			
RATE OF LOADING (in/min) 0.00064		MOISTURE CONDITION FLOODED		G <sub>s</sub> (+) #4			
TYPE OF SPECIMEN ROUND		AREA (sq in) 4.9	THICKNESS (in) 1.0	G <sub>m</sub> (bulk)(+) #4			
 		TEST NO.	1	2	3	4	
		INIT MOISTURE, %	16.7	16.7	16.7		
		DRY DENSITY, $\frac{g}{cc}$ <input checked="" type="checkbox"/> $\frac{g}{cc}$ <input type="checkbox"/> $\frac{pc}{cc}$	1.25	1.25	1.25		
		INIT VOID RATIO					
		TEST DURATION, min	456	459	469		
		FINAL MOISTURE, %	30.2	25.1	26.2		
		NORMAL STRESS psi	2	4	6		
		MAX SHEAR STRESS psi	1.4	2.4	3.4		
		SHEAR VALUES		$\phi$		c	
		AT MAXIMUM STRESS		27°		50 psf	
REMARKS							



Unconfined Compression Test Data



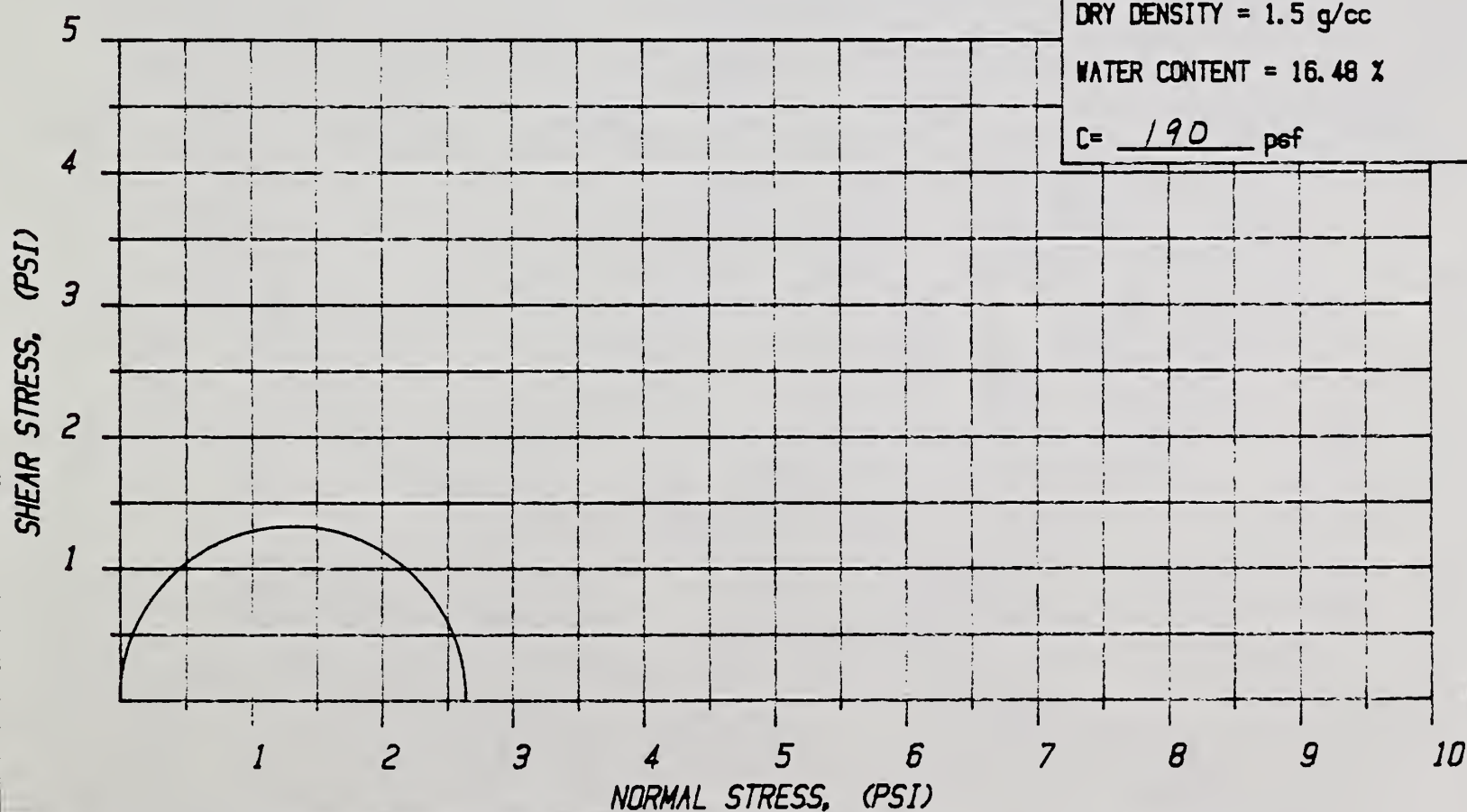
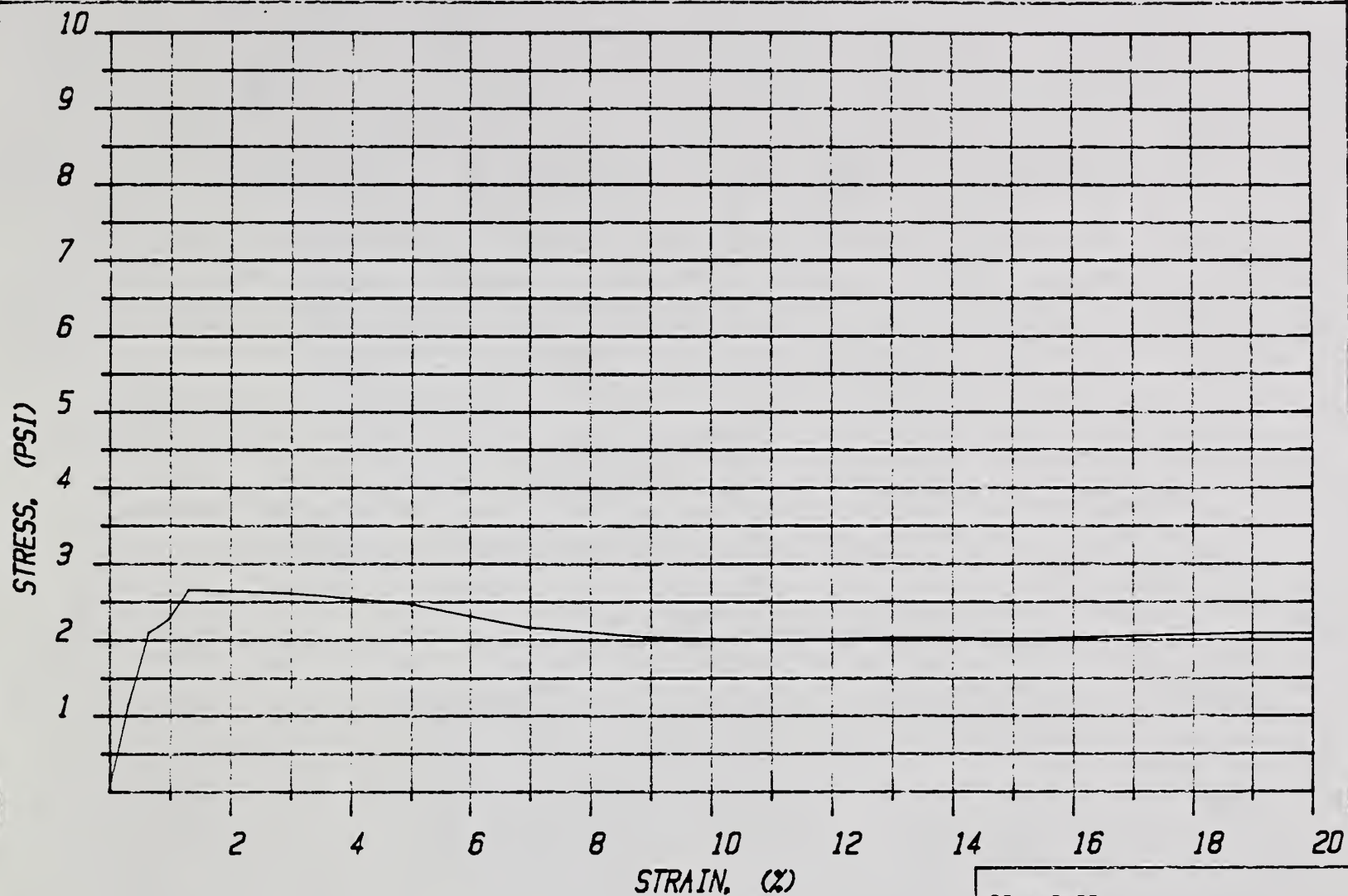


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C 89

PROJECT: WEPP - ABILENE SOIL - TEXAS



GS = 2.63

DRY DENSITY = 1.5 g/cc

WATER CONTENT = 16.48 %

C = 190 psf



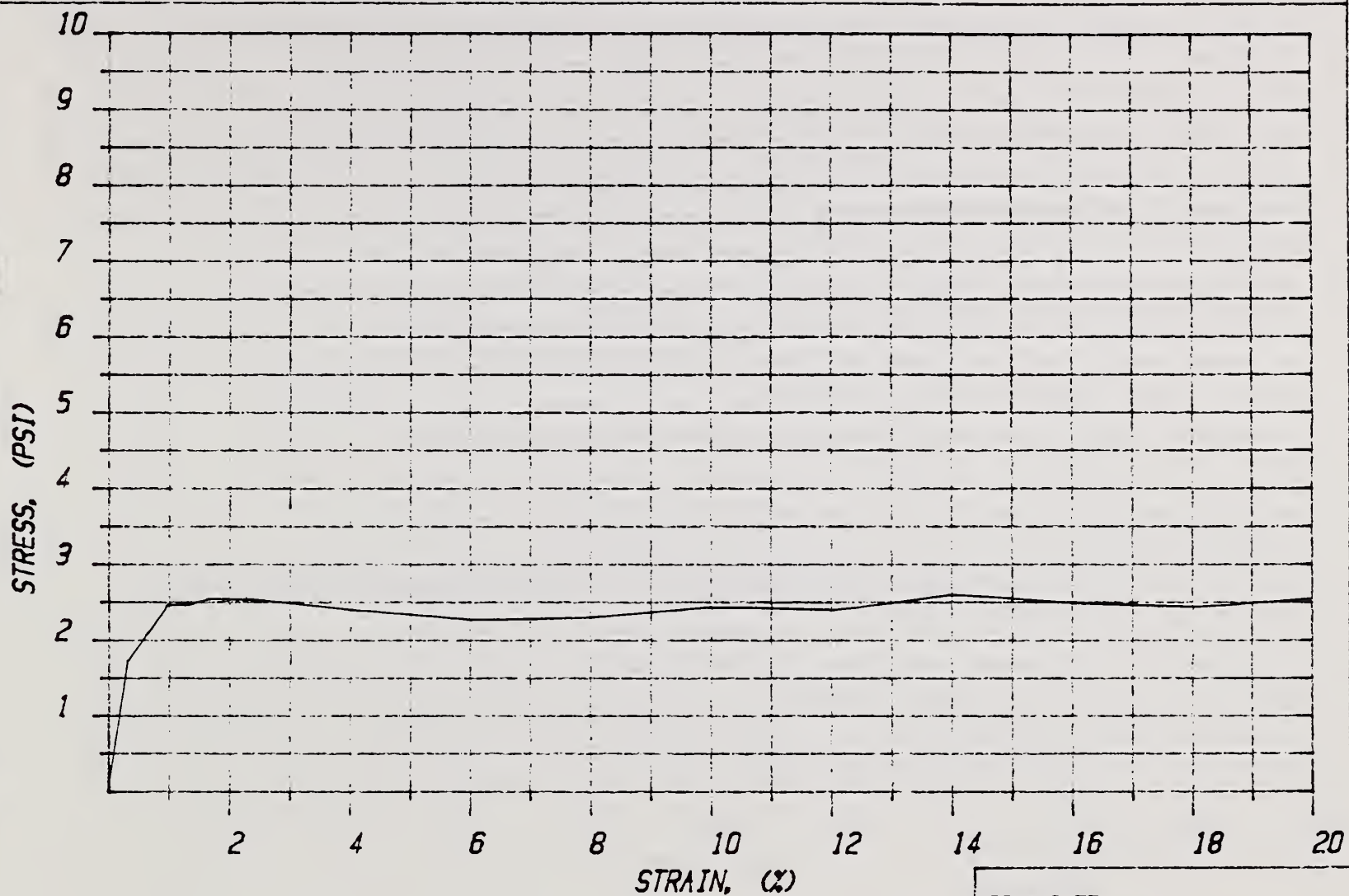


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C 90

PROJECT: WEPP - ACADEMY SOIL - FRESNO CA.

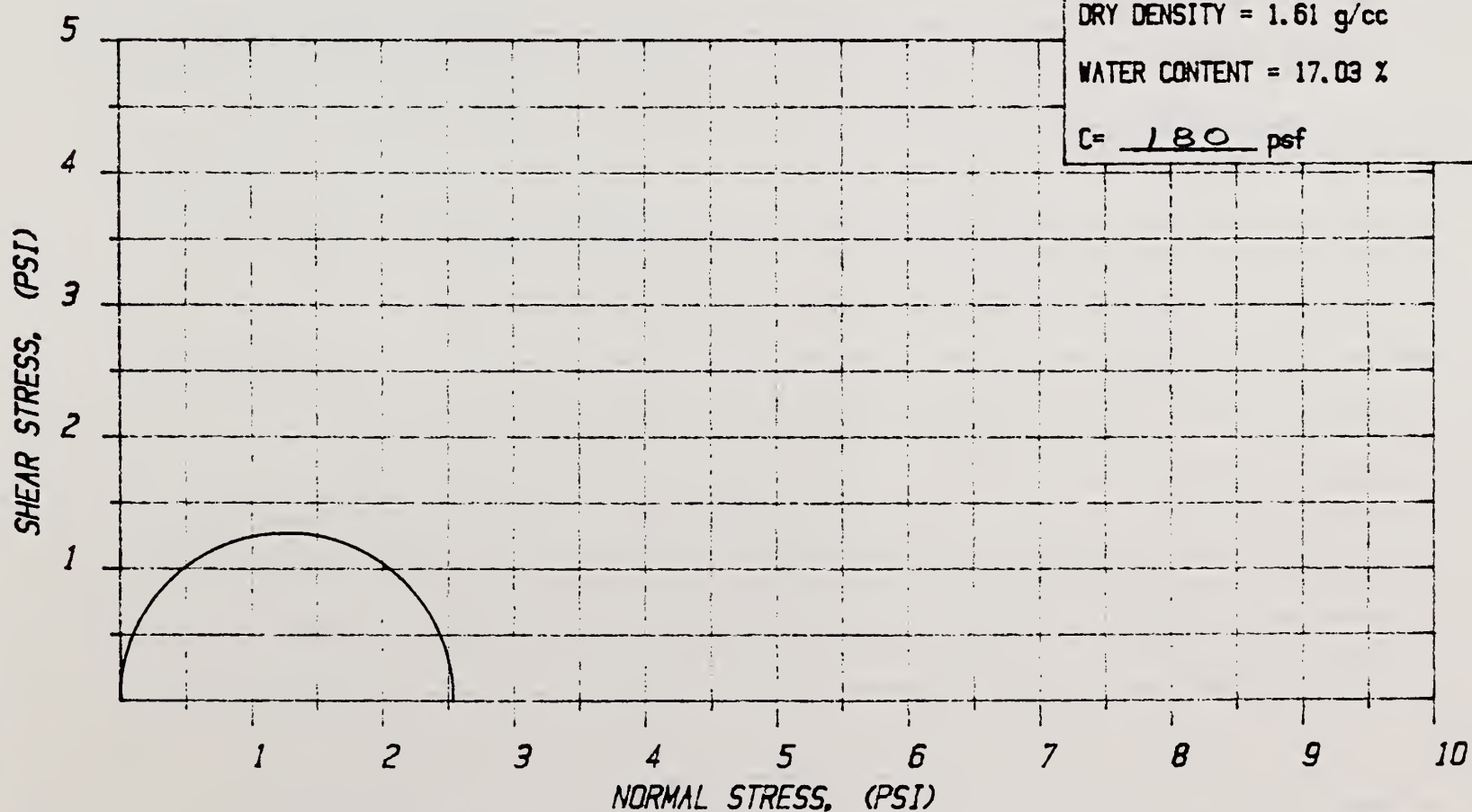


GS = 2.75

DRY DENSITY = 1.61 g/cc

WATER CONTENT = 17.03 %

C = 180 psf



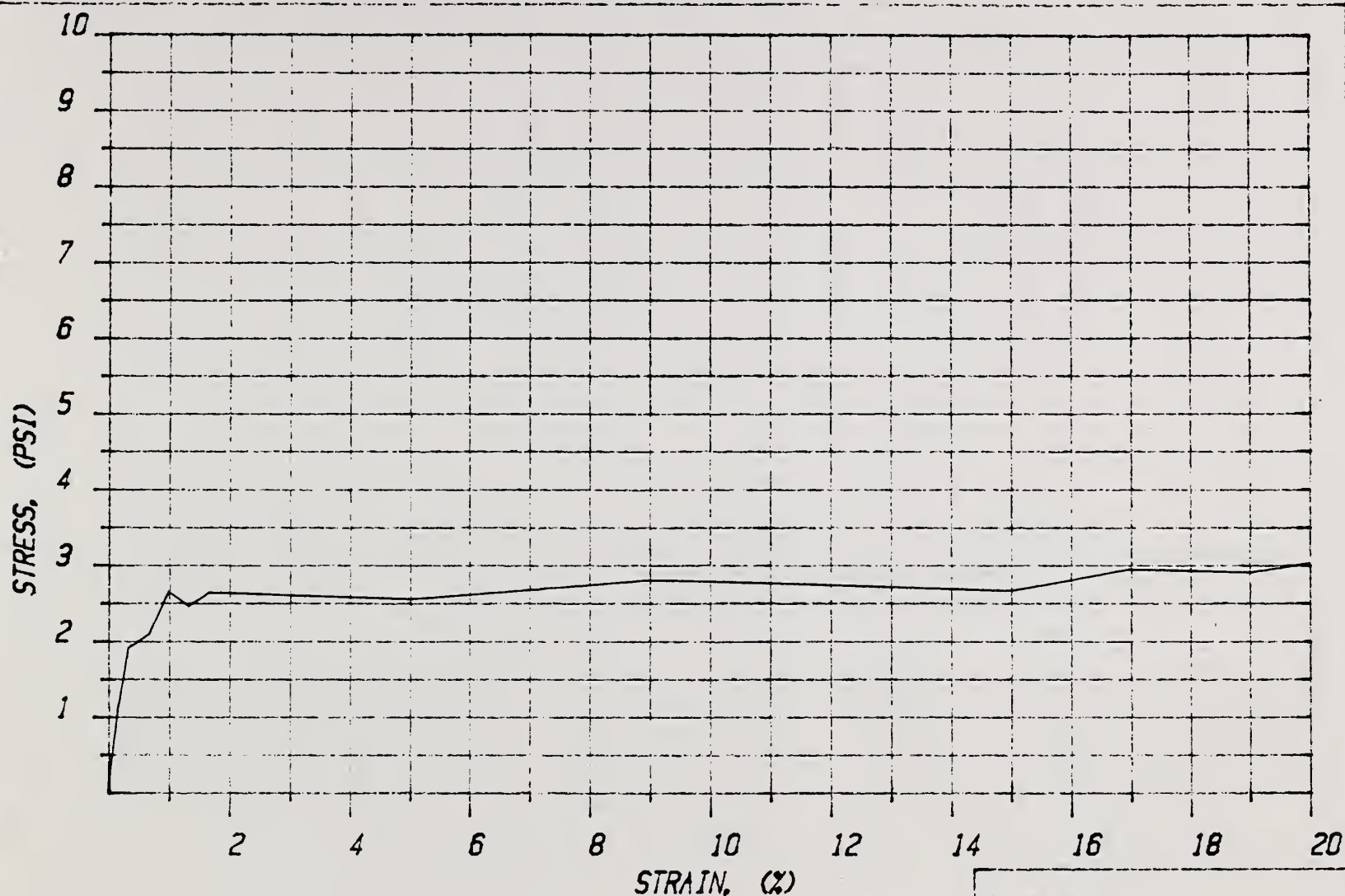


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C 91

PROJECT: WEPP - BARNES SOIL - MORRIS MN.

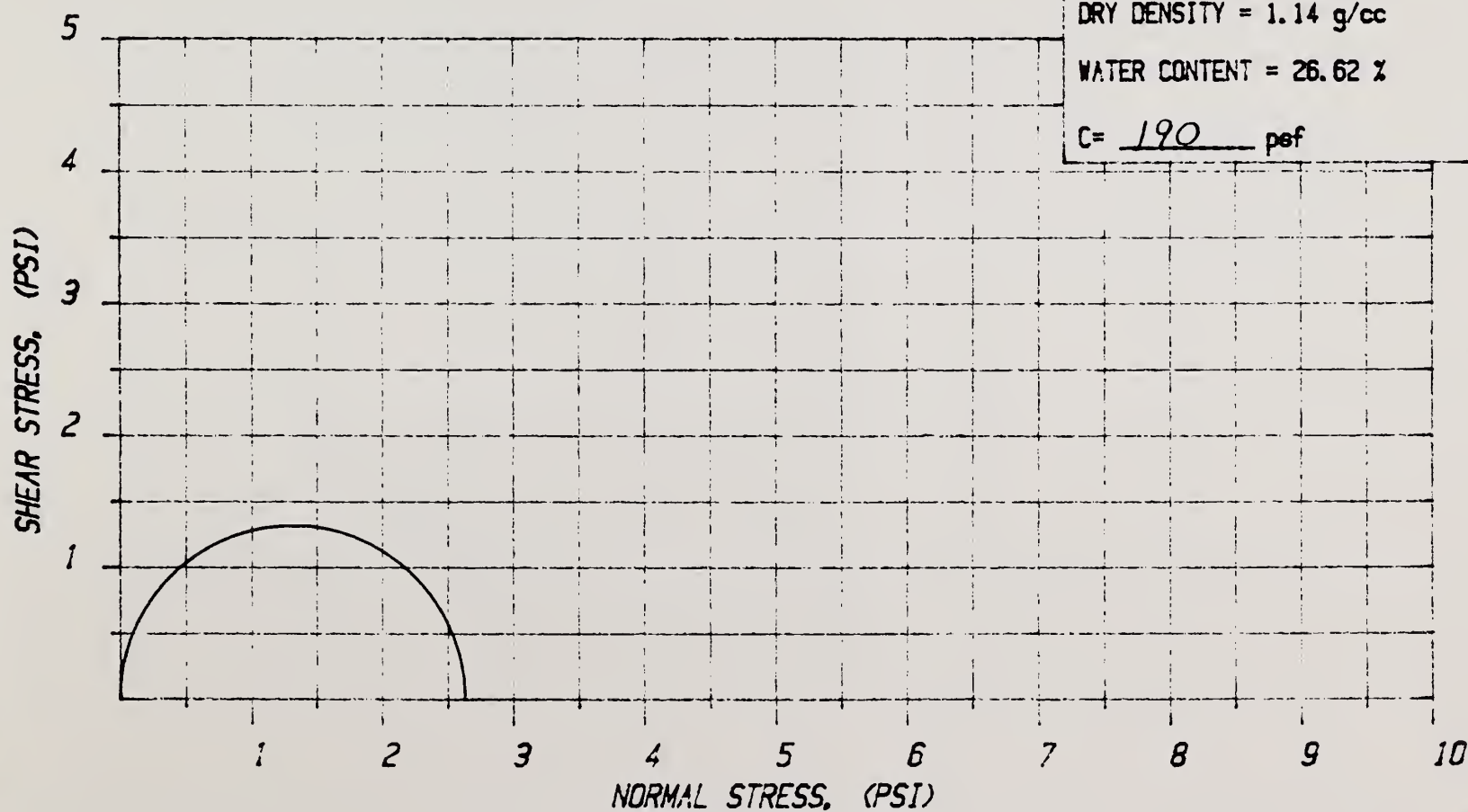


GS = 2.61

DRY DENSITY = 1.14 g/cc

WATER CONTENT = 26.62 %

C = 190 psf





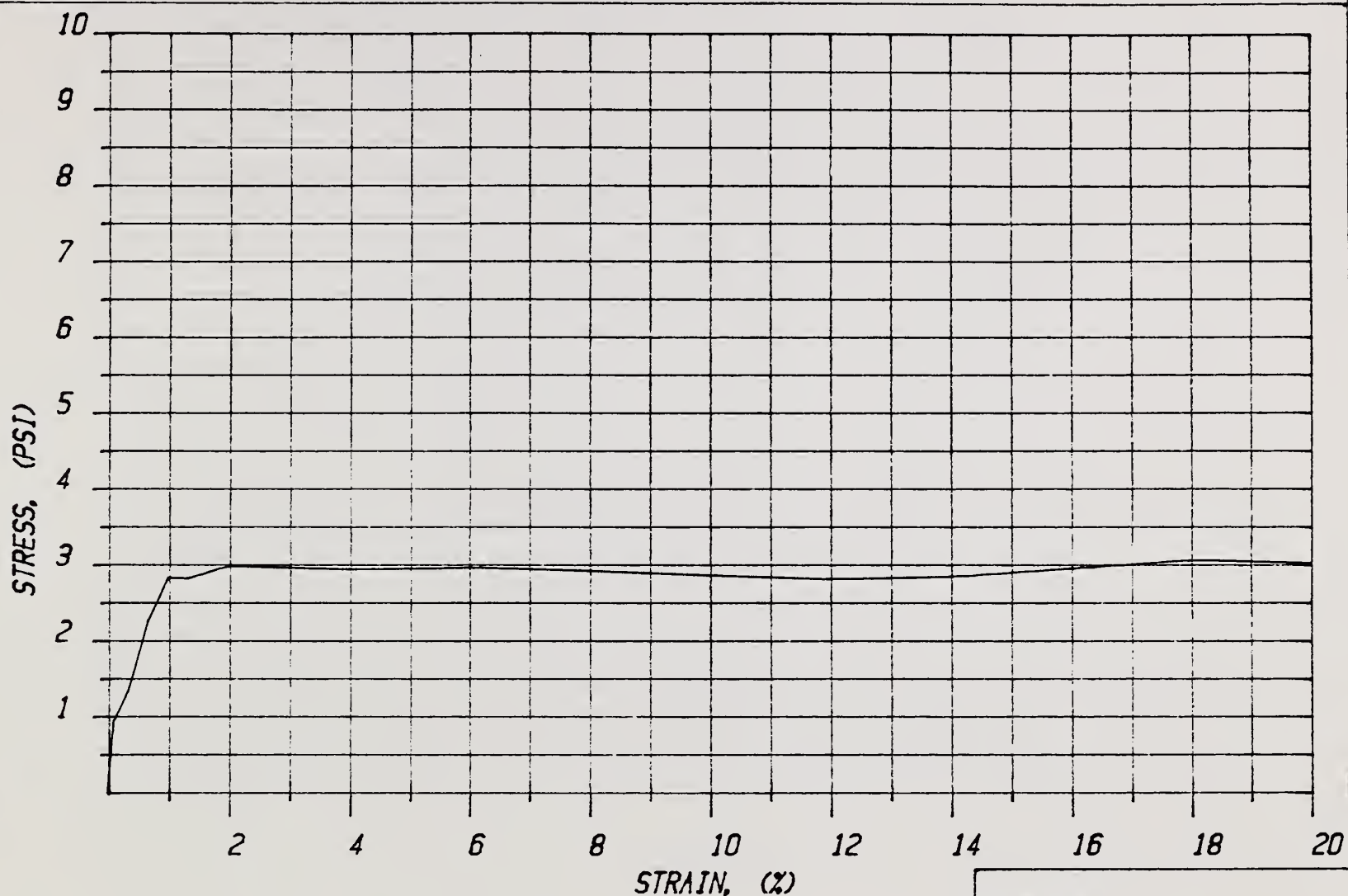


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C 92

PROJECT: WEPP - BARNES SOIL - McCLUSKY ND.

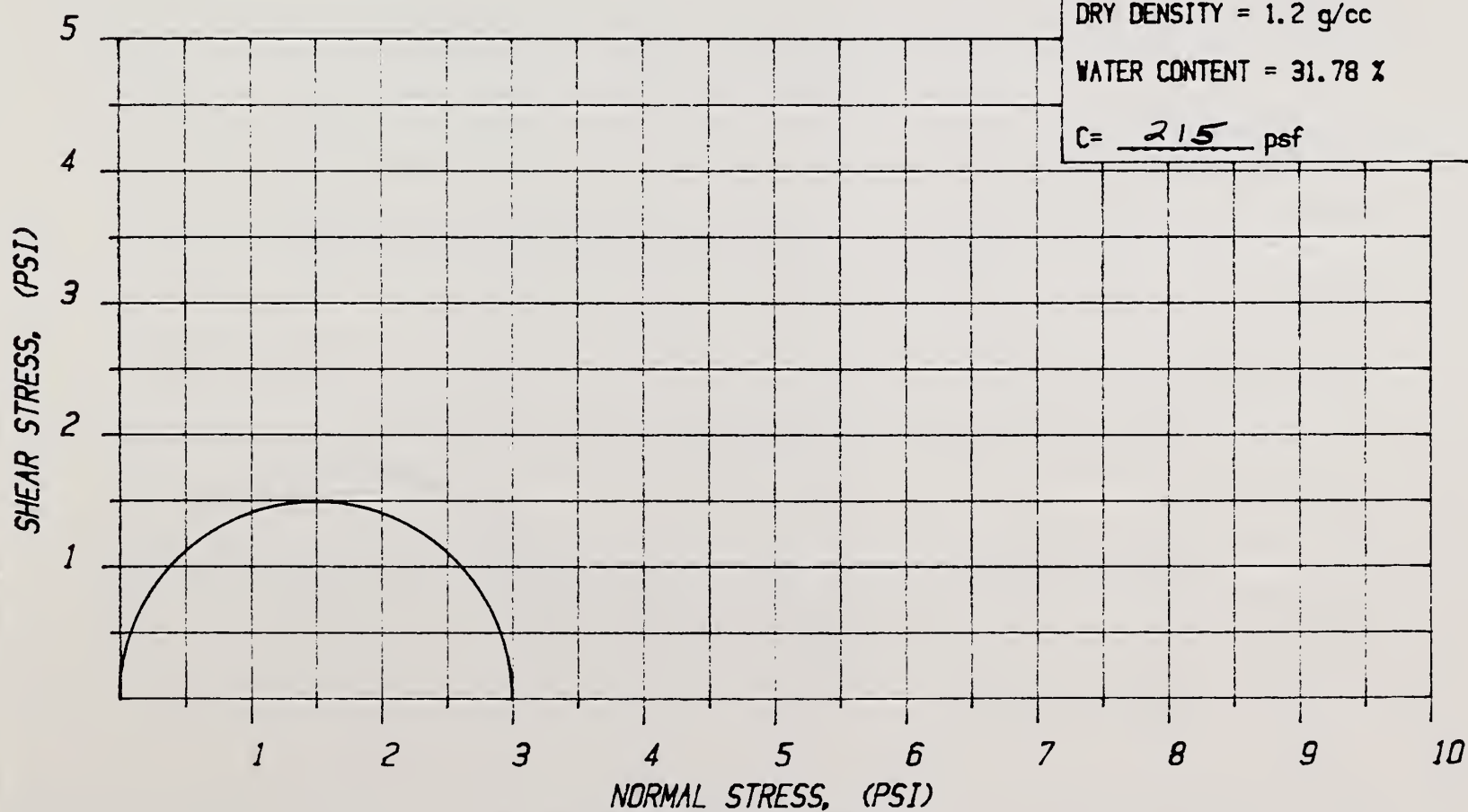


GS = 2.55

DRY DENSITY = 1.2 g/cc

WATER CONTENT = 31.78 %

C = 215 psf





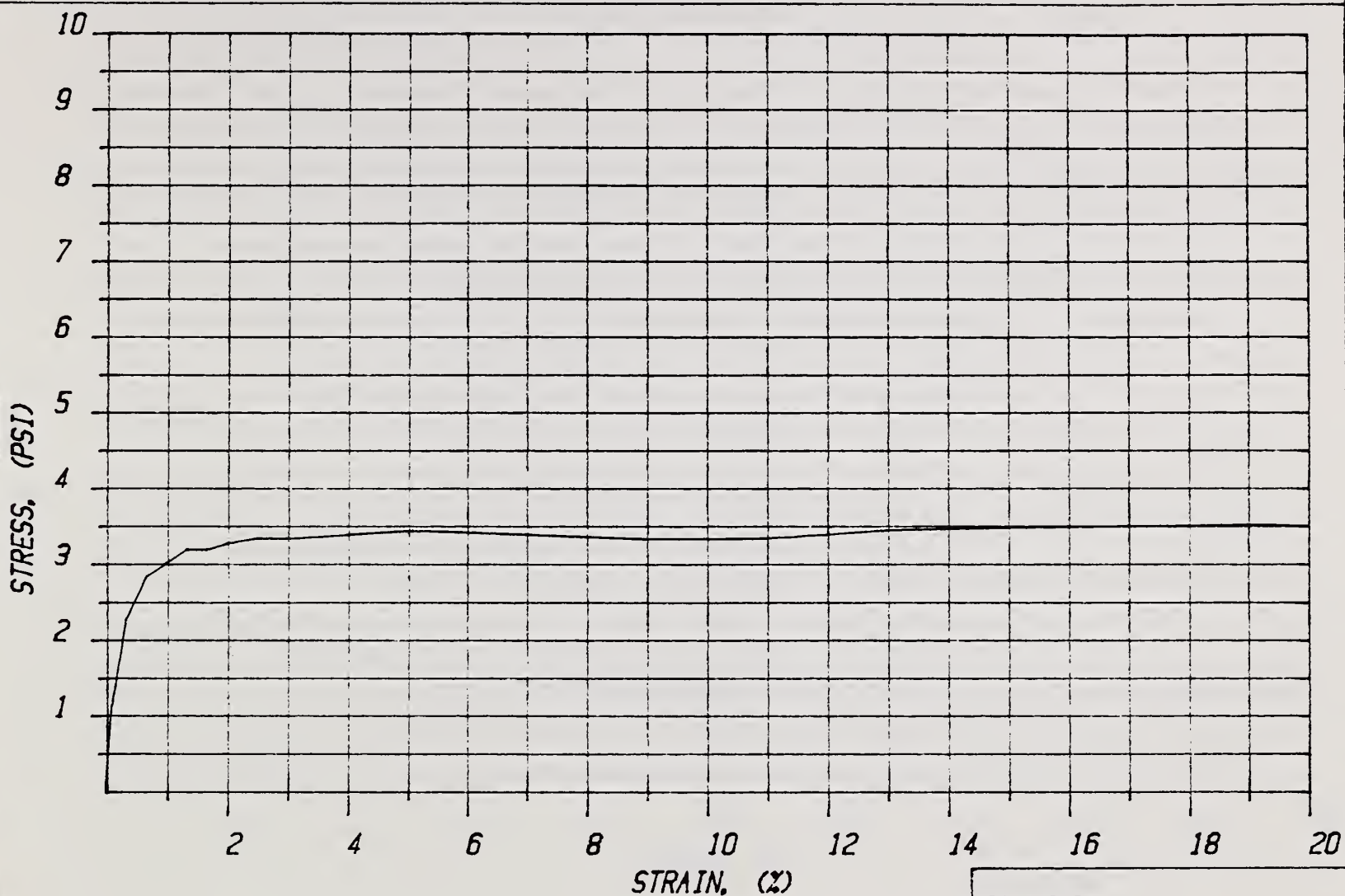


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C 93

PROJECT: WEPP - HEIDEN SOIL - WACO TX.

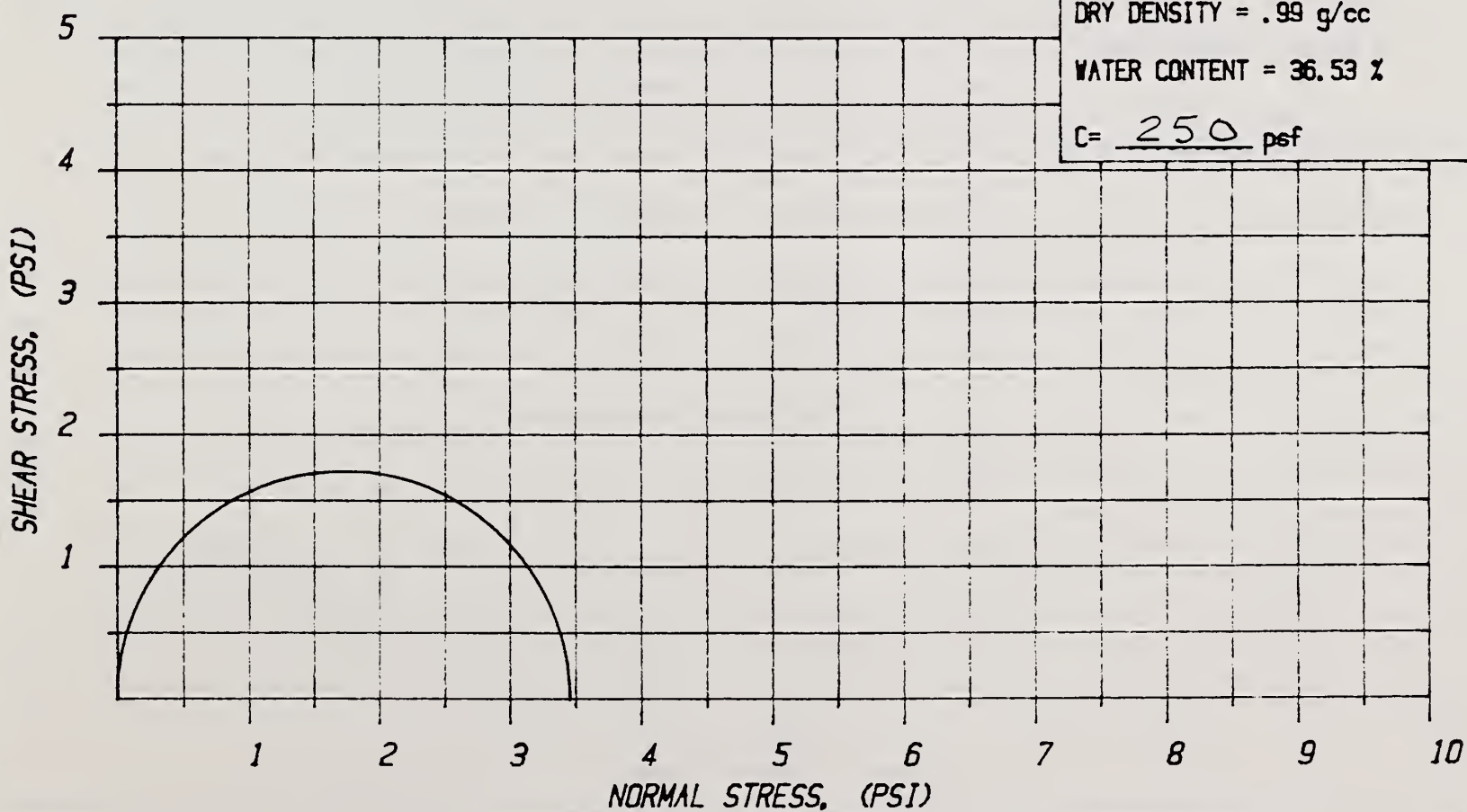


GS = 2.67

DRY DENSITY = .99 g/cc

WATER CONTENT = 36.53 %

C = 250 psf



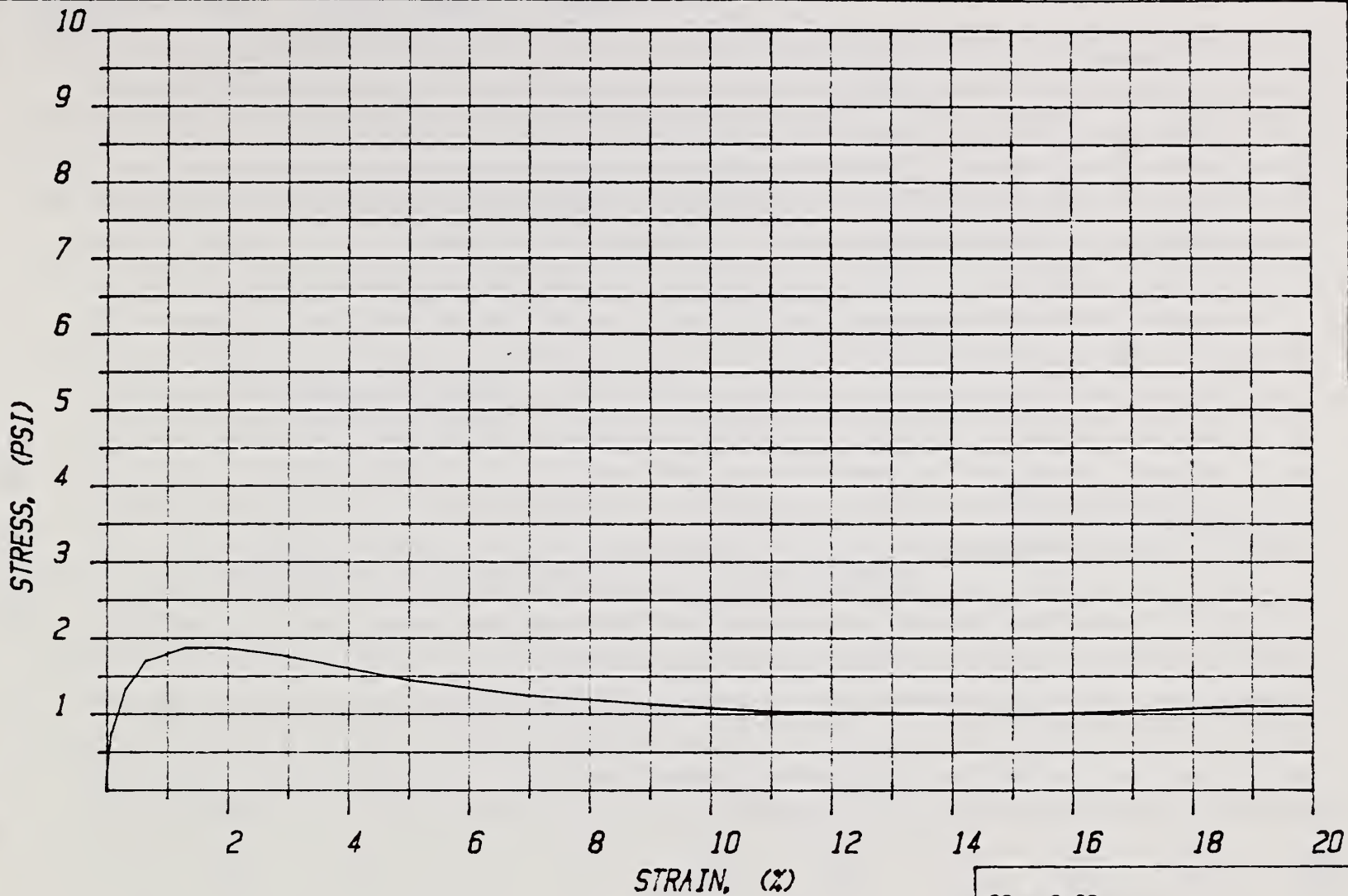


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C 94

PROJECT: WEPP - HIRSH SOIL - ORD NE.

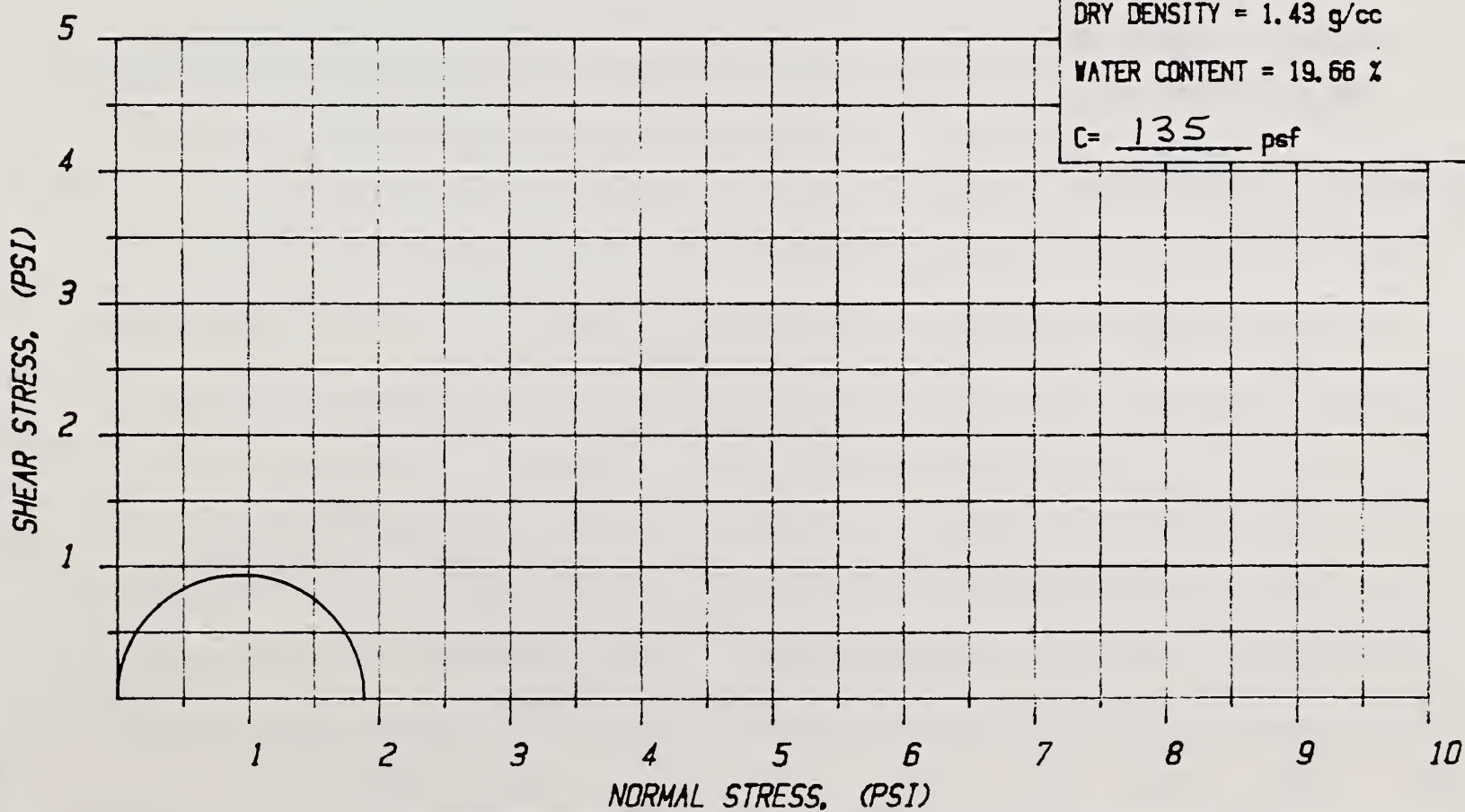


GS = 2.63

DRY DENSITY = 1.43 g/cc

WATER CONTENT = 19.66 %

C = 135 psf





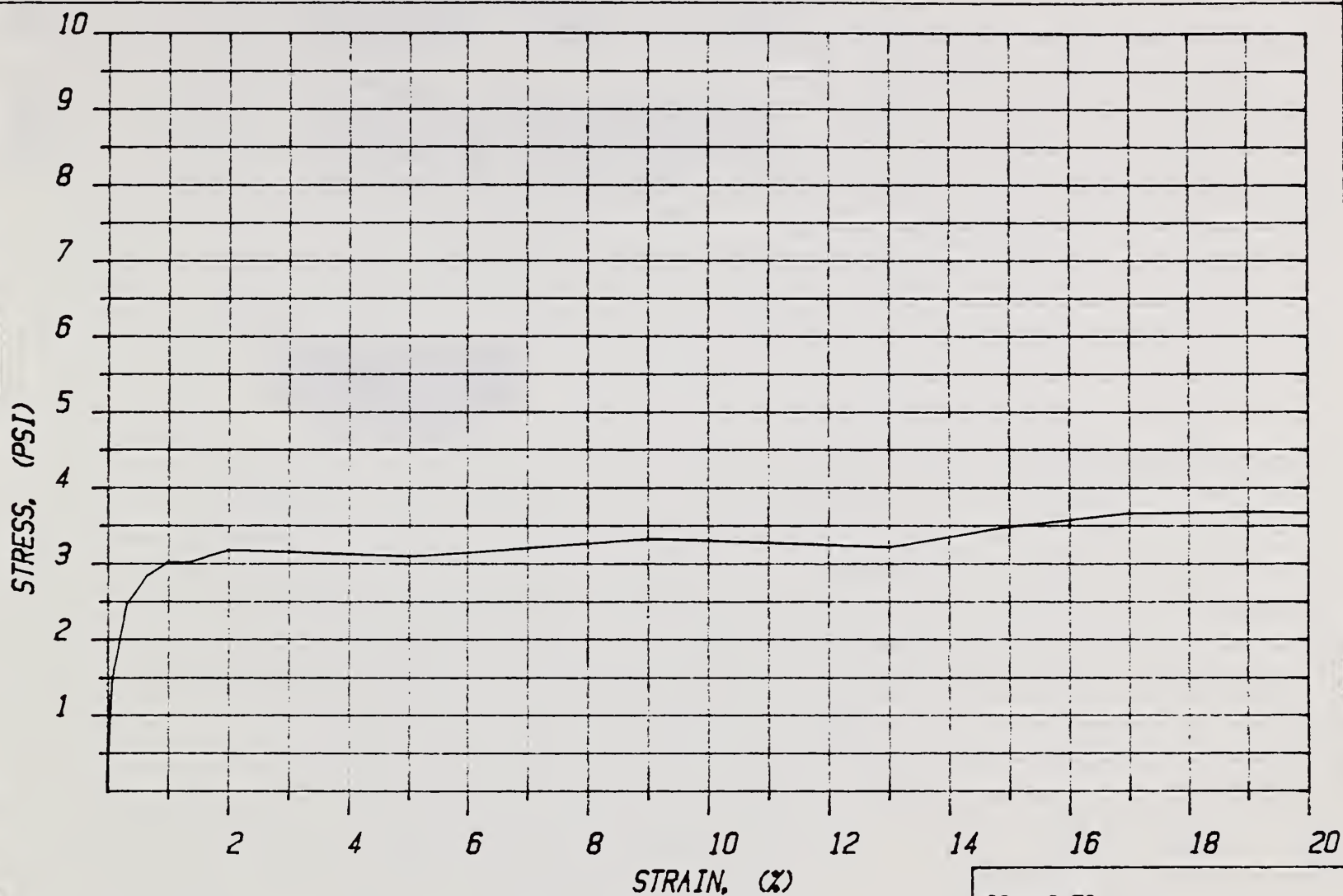


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C 95

PROJECT: WEPP - KEITH SOIL - ALBIN WY.

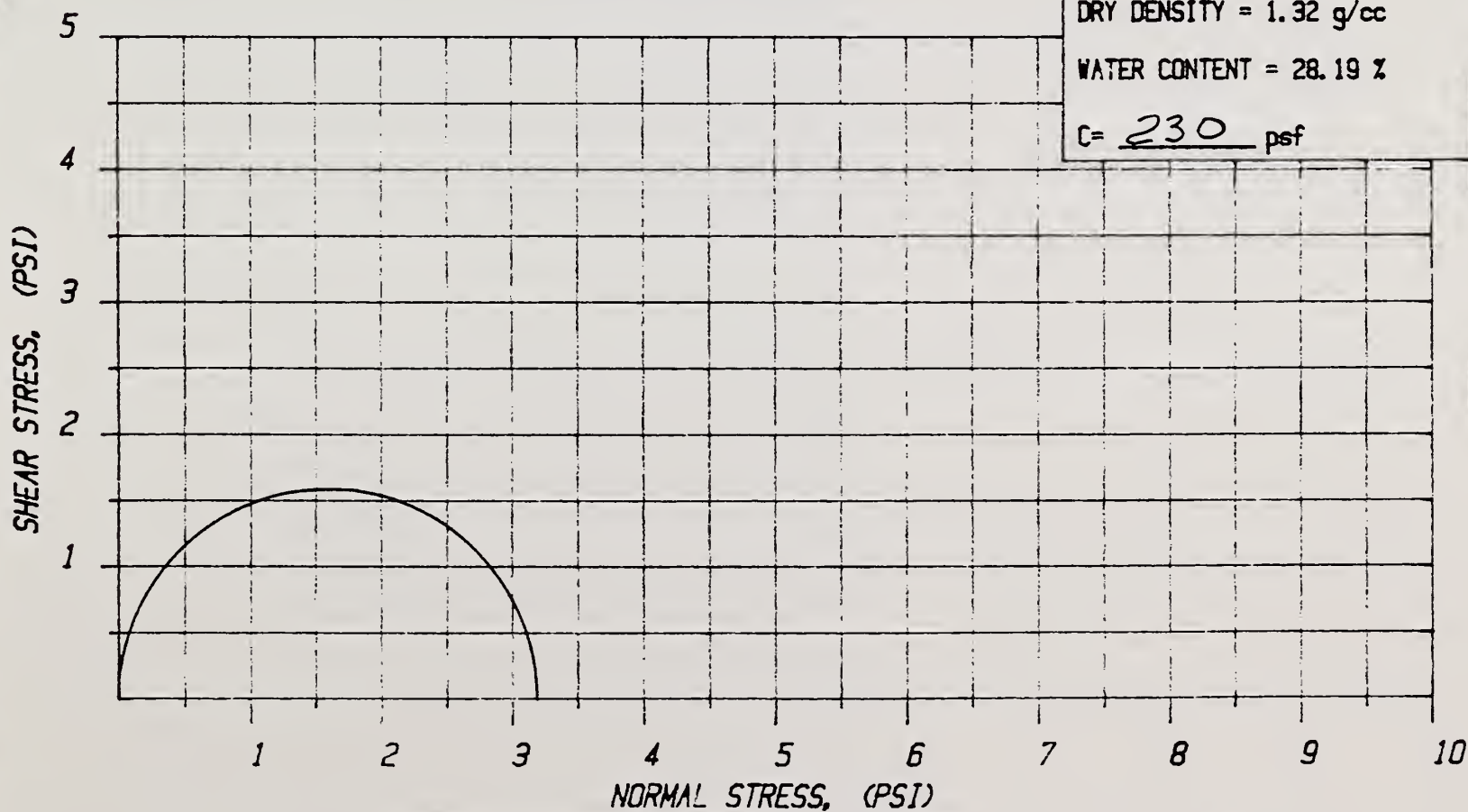


GS = 2.59

DRY DENSITY = 1.32 g/cc

WATER CONTENT = 28.19 %

C = 230 psf







Tag	Ind 1	Ind 2	Field Data
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001			935968
005			20050420123734.0
006			a_____001_0_
008			050420s1987_____nbua_____000_0_eng_d
040			‡a AGLG
245	1		‡a WEPP 1987 cropland samples : ‡b soil mechanics tests.
260			‡a Lincoln, NE : ‡b USDA, Soil Conservation Service, Midwest National Technical Center, Soil Mechanics Laboratory, ‡c 1987.

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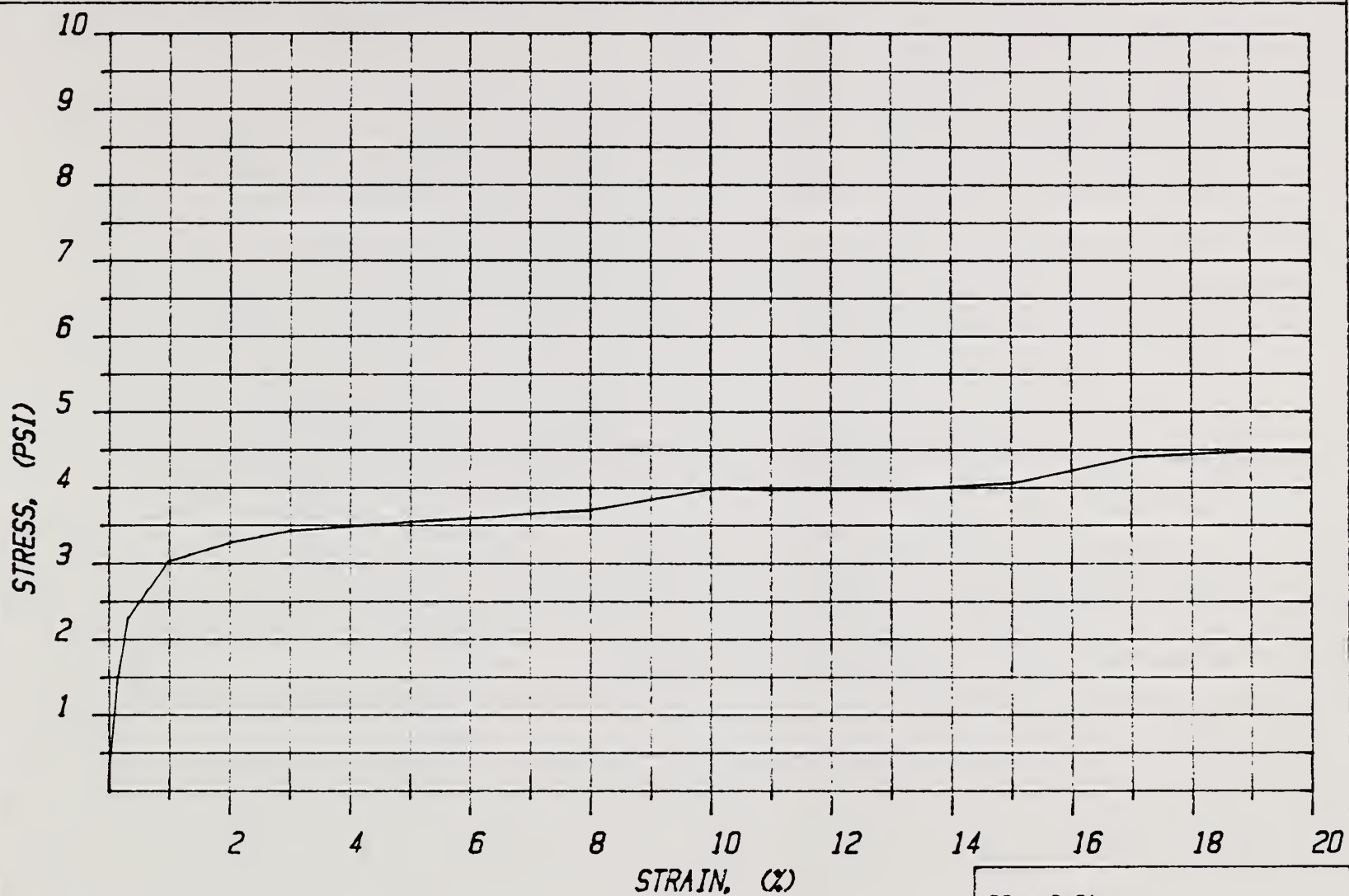


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C 96

PROJECT: WEPP - LOS BANOS SOIL - FRESNO CA.

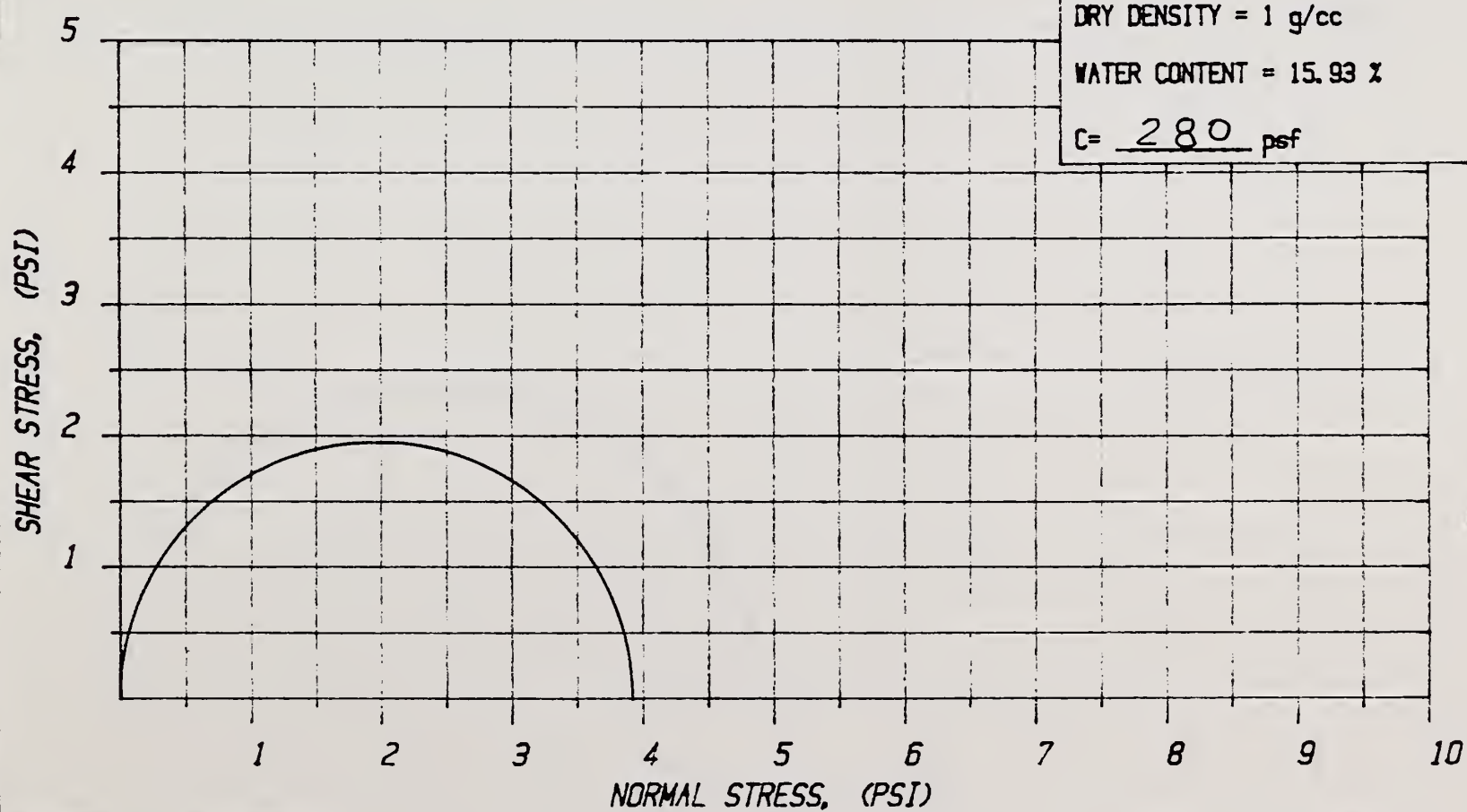


GS = 2.61

DRY DENSITY = 1 g/cc

WATER CONTENT = 15.93 %

c = 280 psf





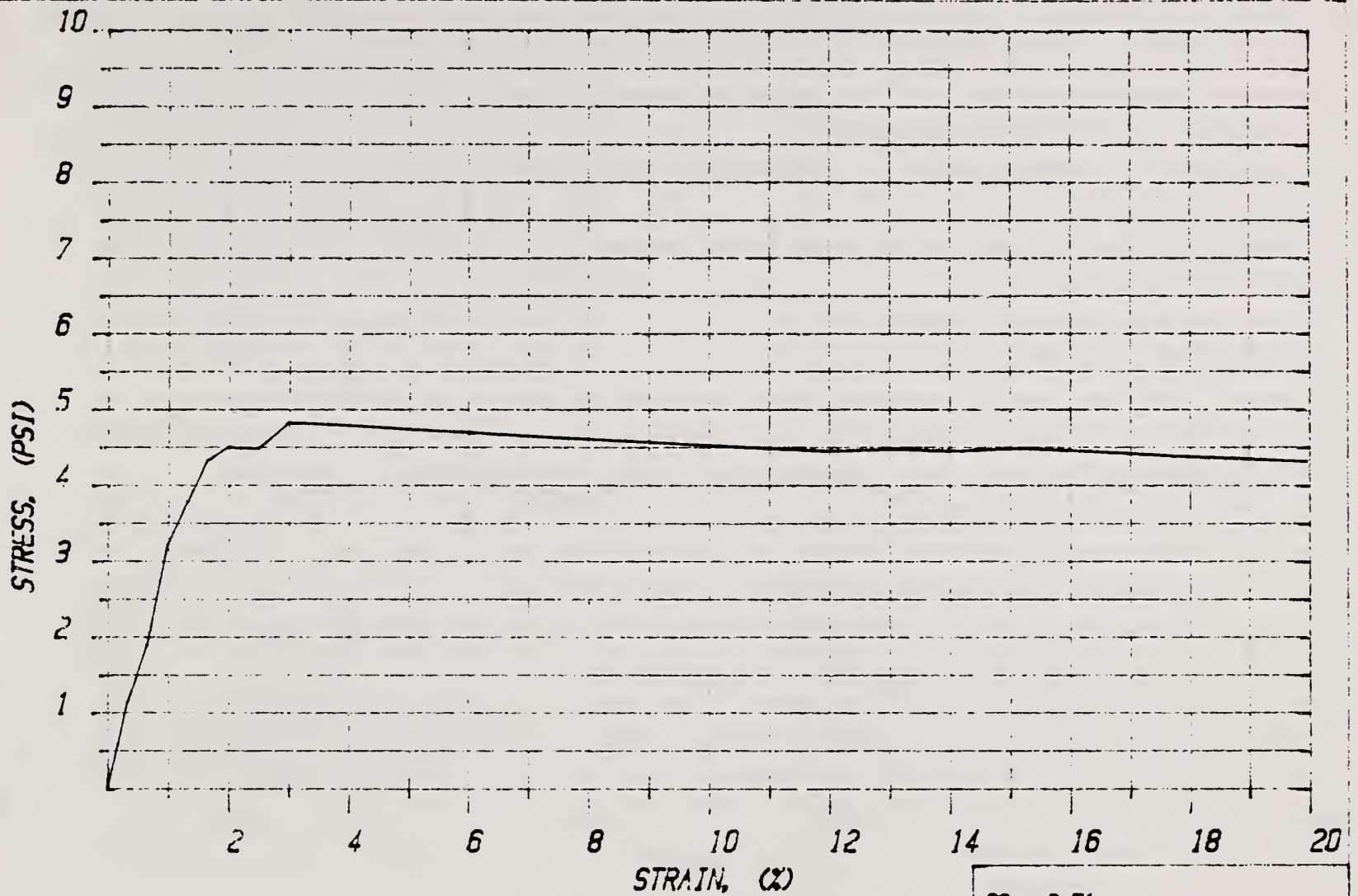


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C97

PROJECT: WEPP - PIERRE SOIL - COTTONWOOD SD.

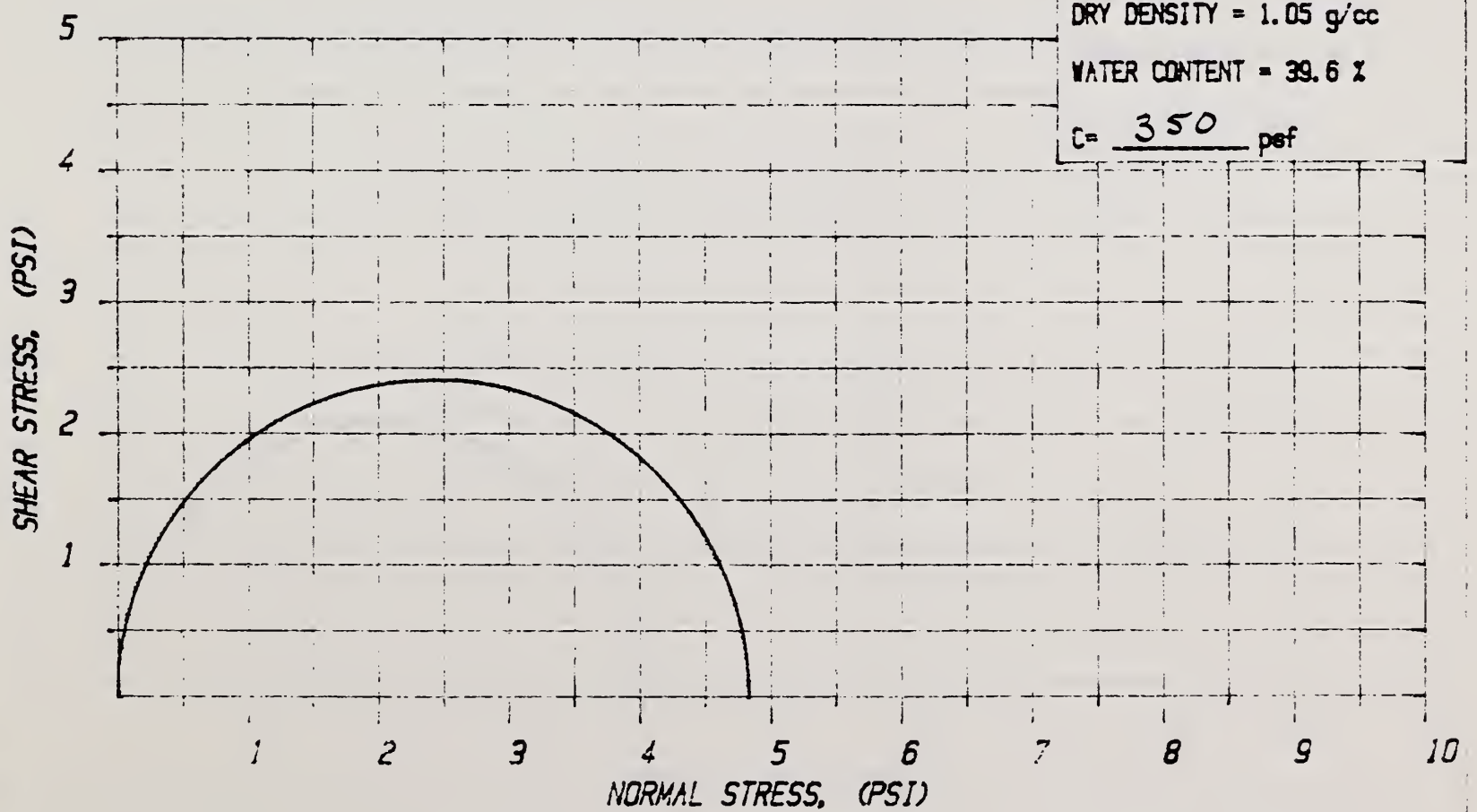


GS = 2.71

DRY DENSITY = 1.05 g/cc

WATER CONTENT = 39.6 %

C = 350 psf



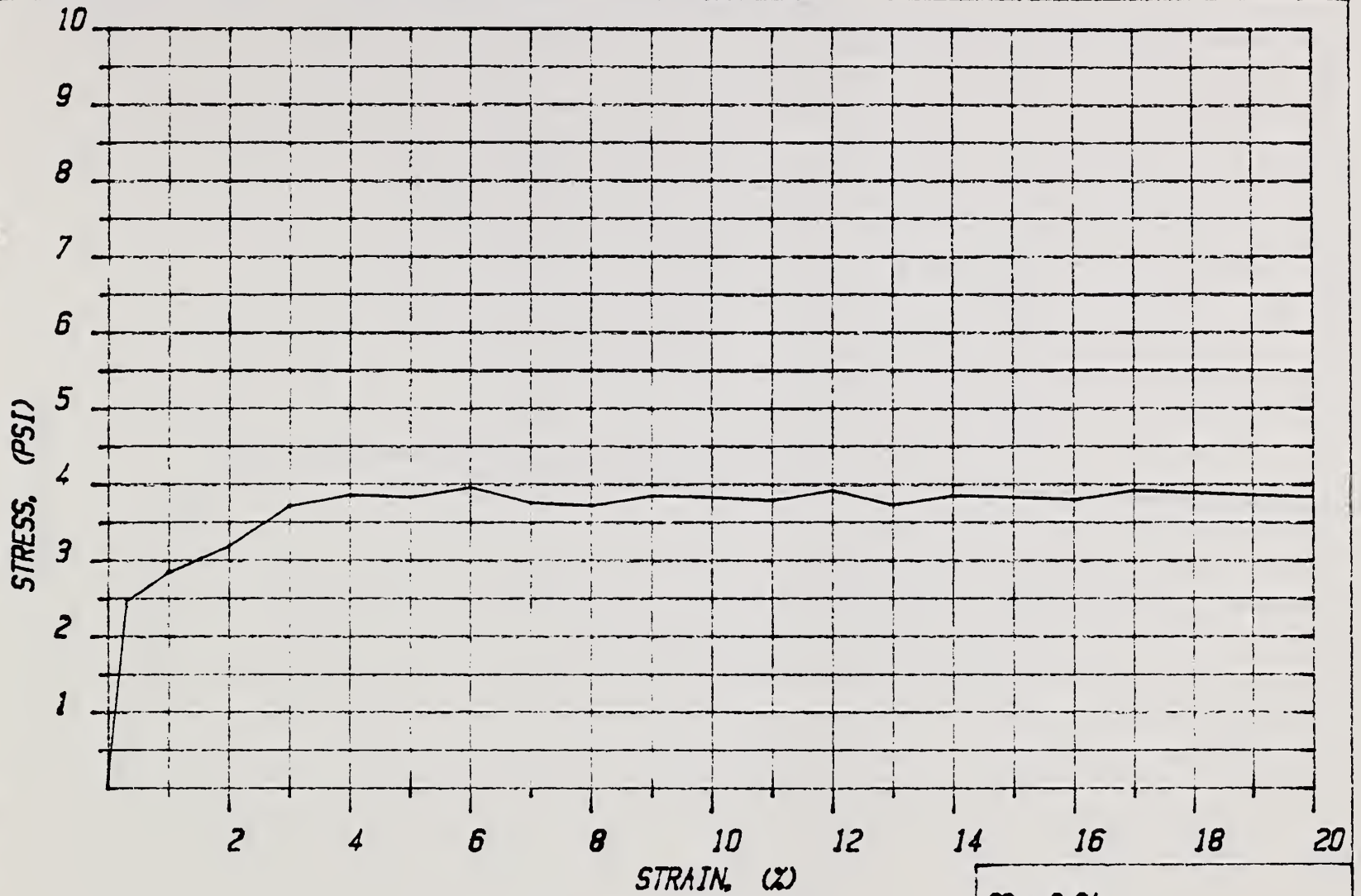


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 99C98

PROJECT: WEPP - PALOUSE SOIL - PULLMAN WA.

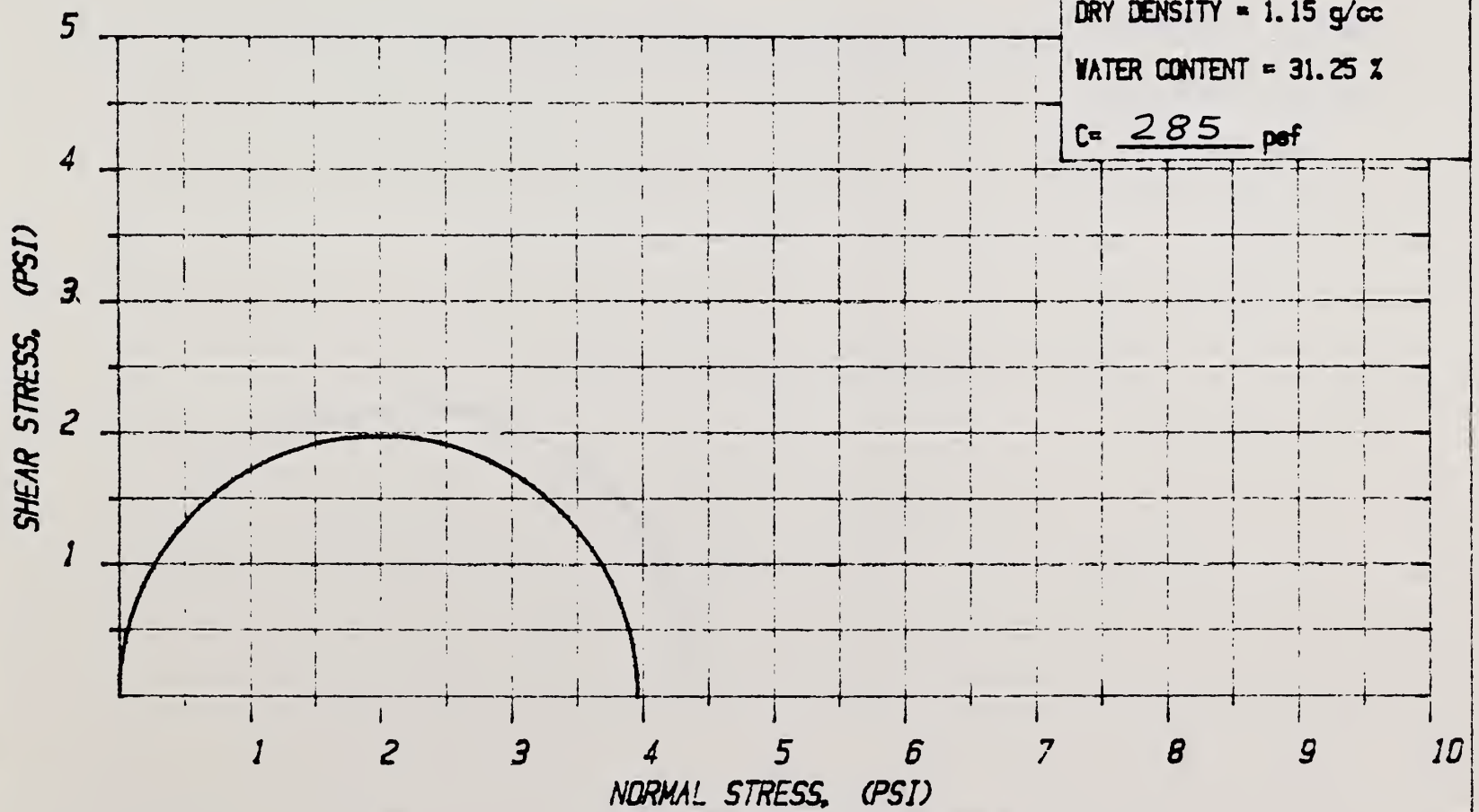


GS = 2.64

DRY DENSITY = 1.15 g/cc

WATER CONTENT = 31.25 %

C = 285 psf





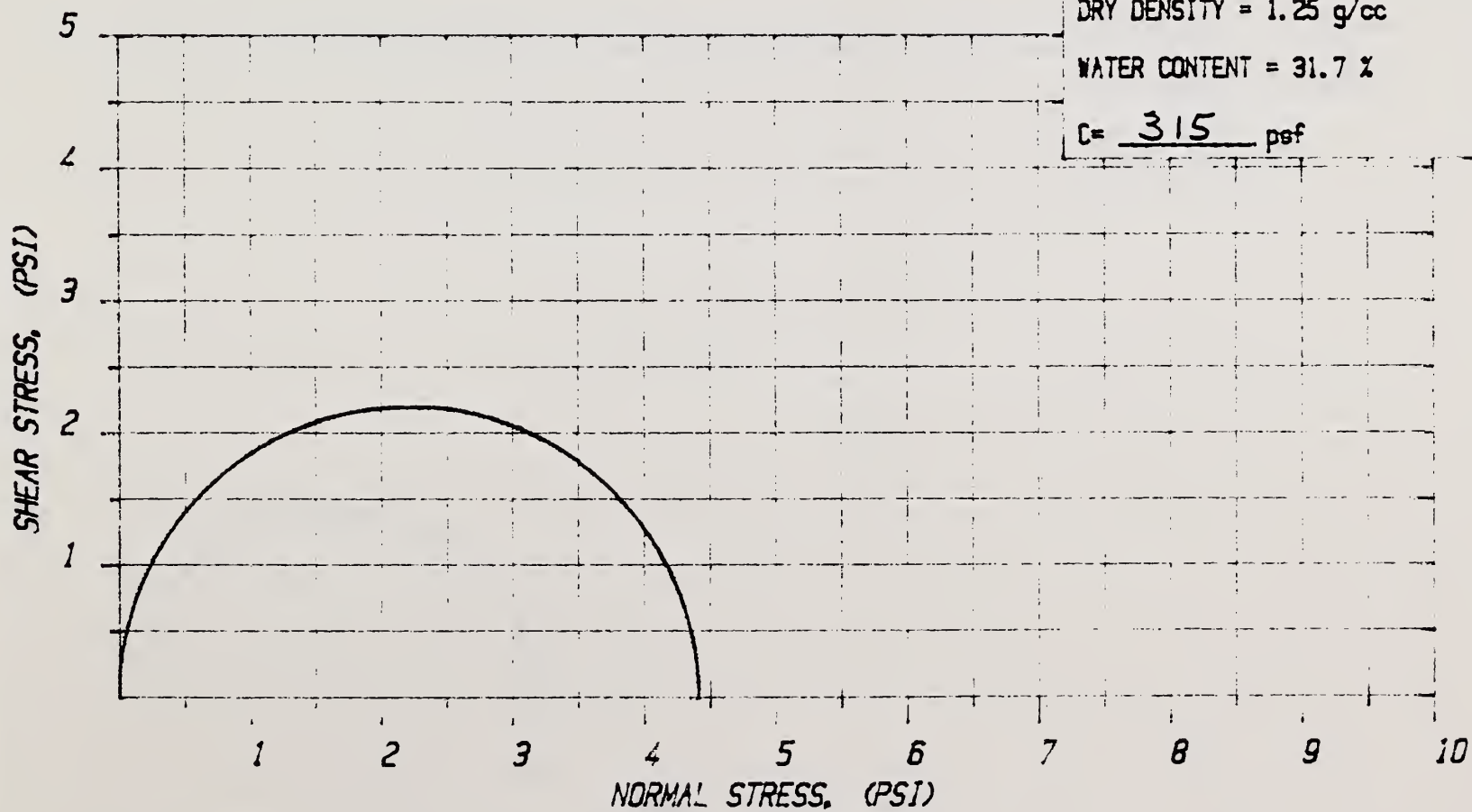
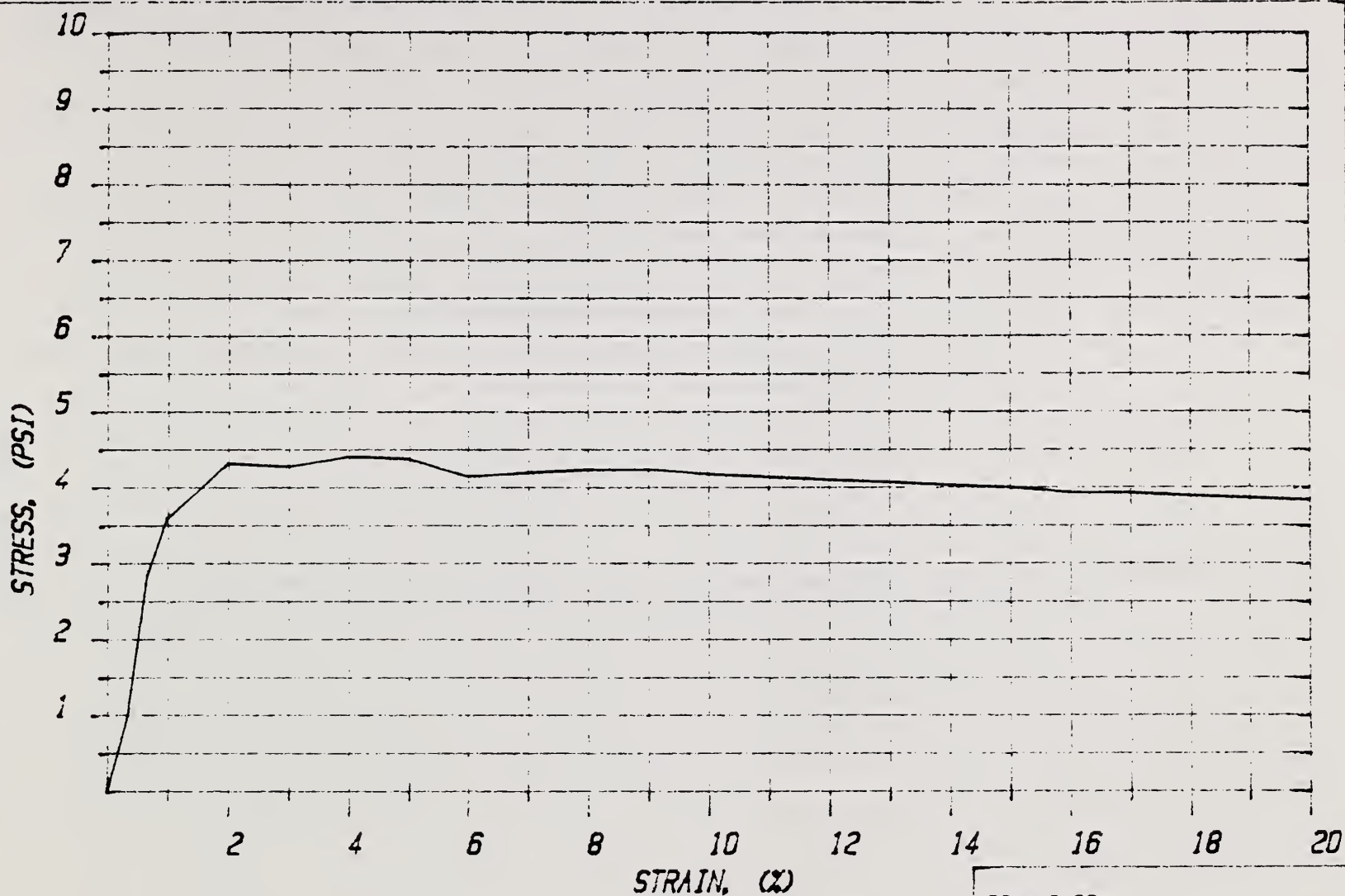


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C99

PROJECT: WEPP - PORTNEUF SOIL - KIMBERLY ID.



GS = 2.66

DRY DENSITY = 1.25 g/cc

WATER CONTENT = 31.7 %

C = 315 psf

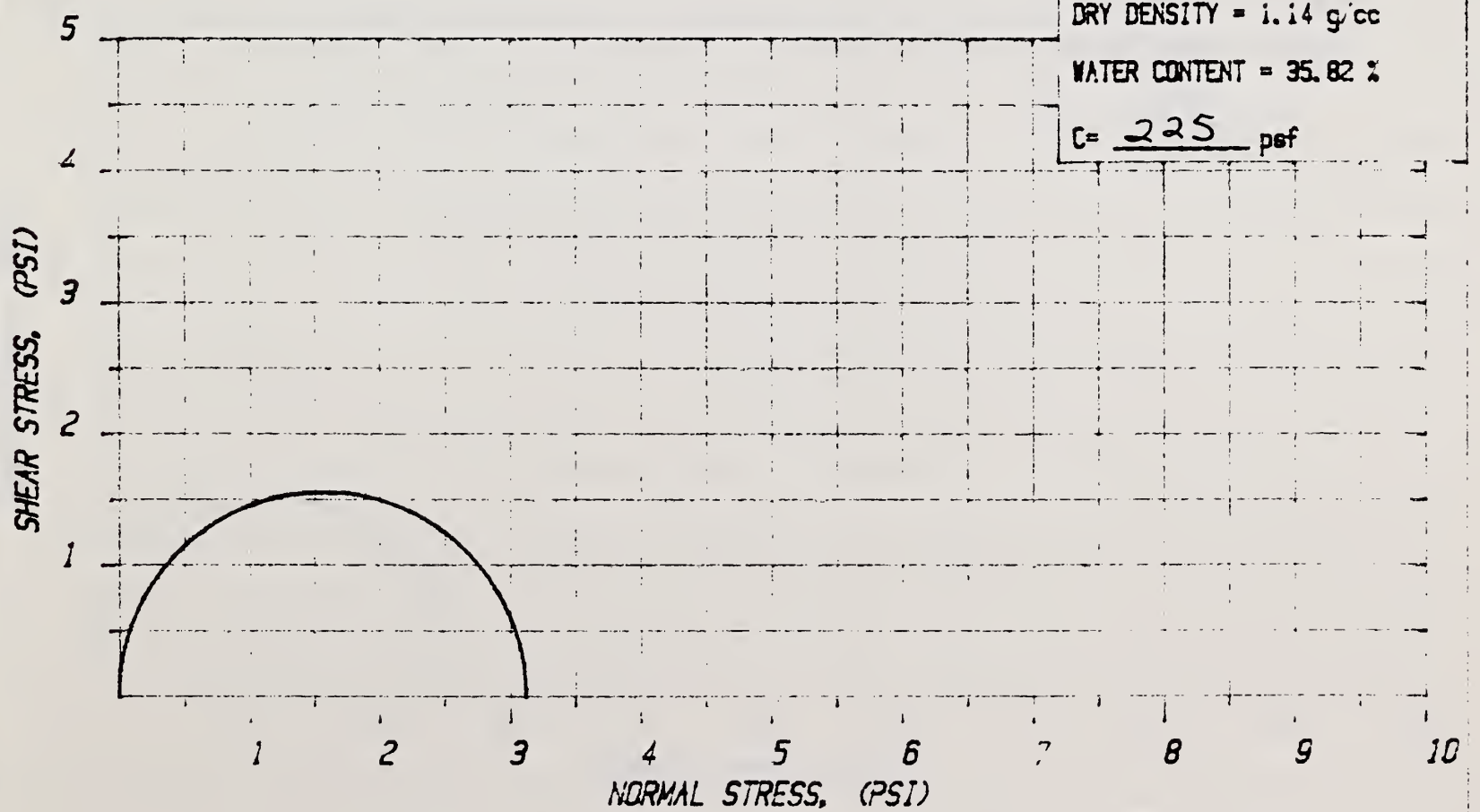
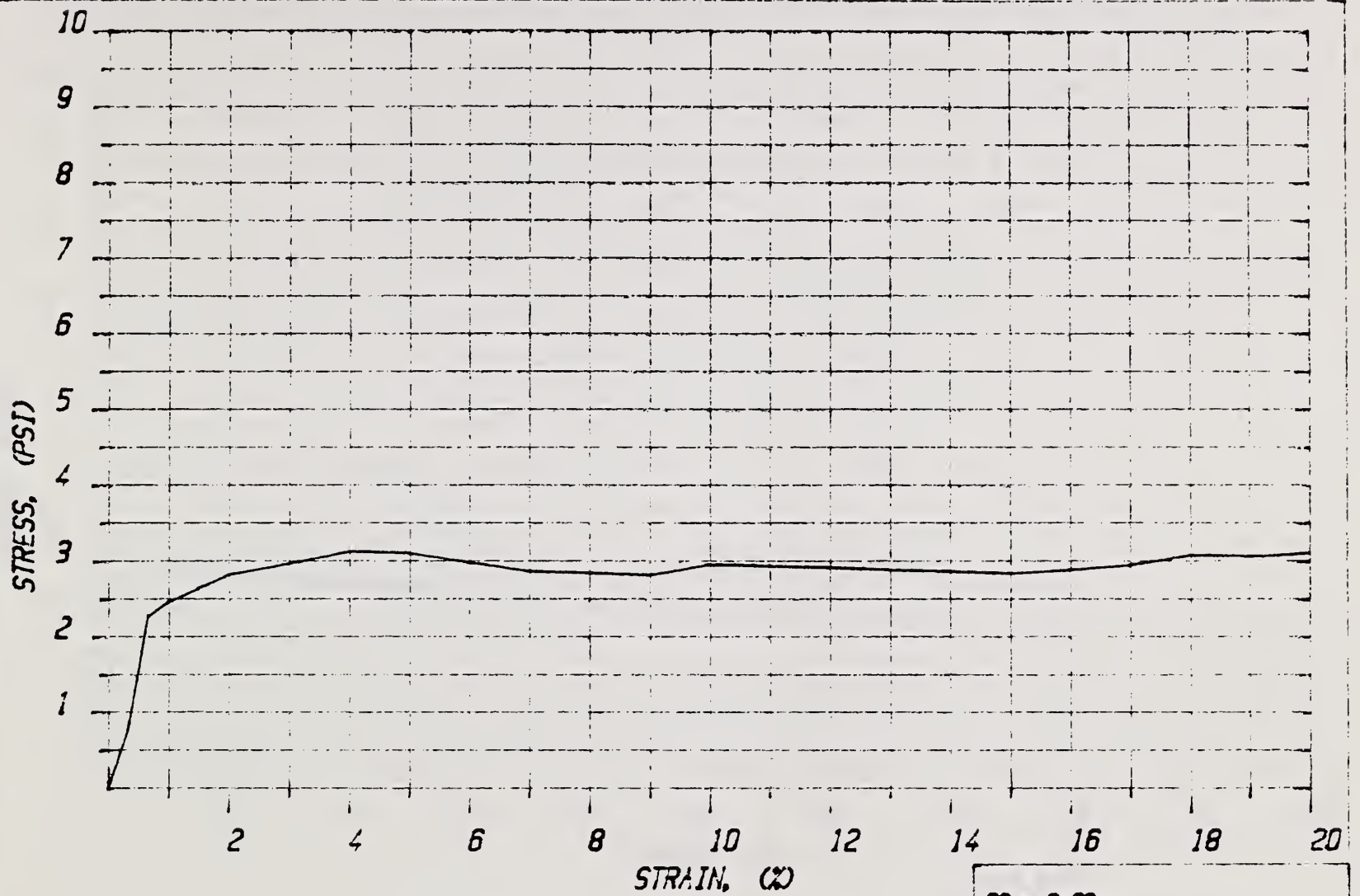


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C100

PROJECT: WEPP - SHARPSBURG SOIL - LINCOLN NE.



GS = 2.63

DRY DENSITY = 1.14 g/cc

WATER CONTENT = 35.82 %

C = 225 psf



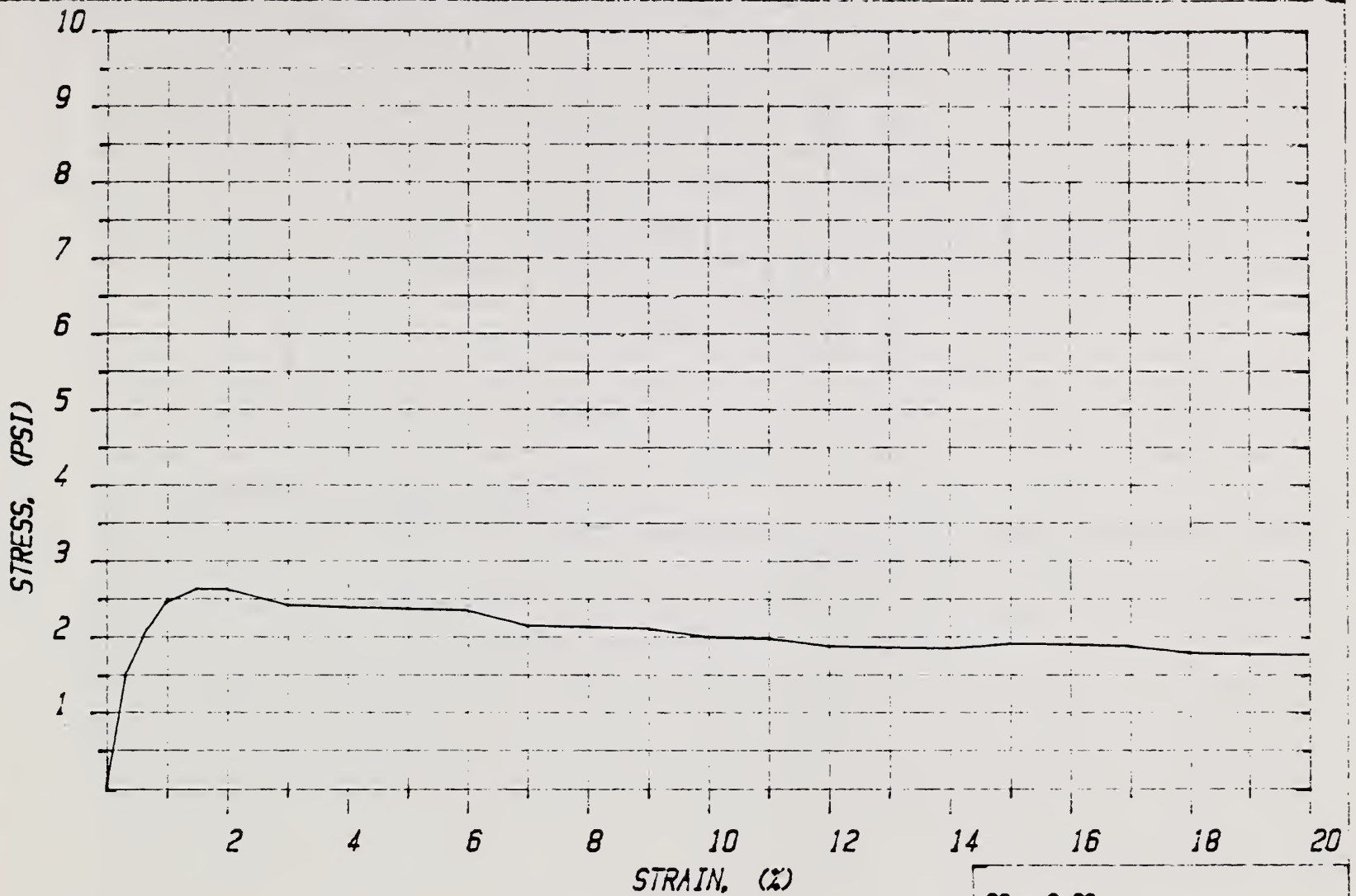


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C101

PROJECT: WEPP - SVERDRUP SOIL - MORRIS MN.

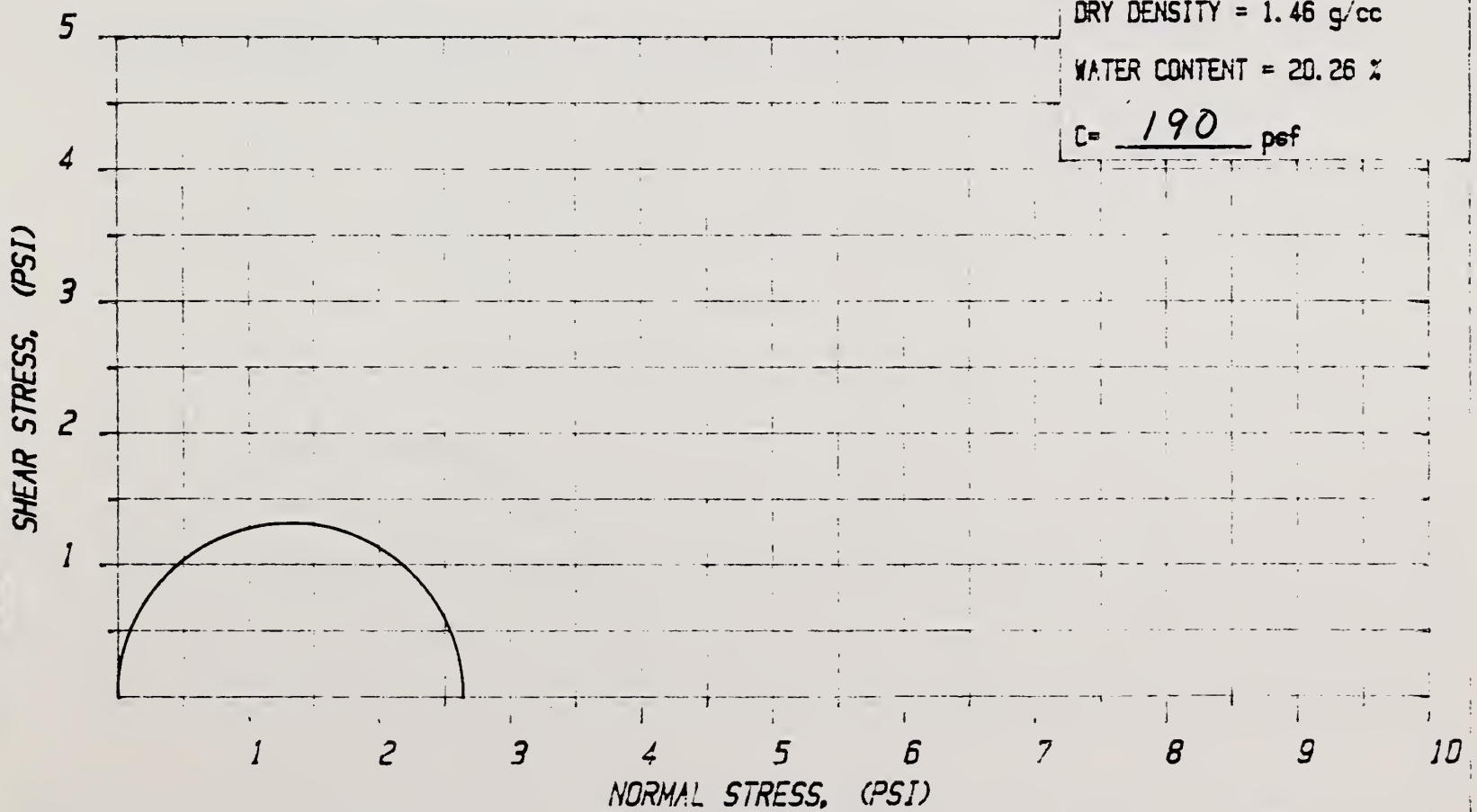


CS = 2.63

DRY DENSITY = 1.46 g/cc

WATER CONTENT = 20.26 %

C = 190 pcf



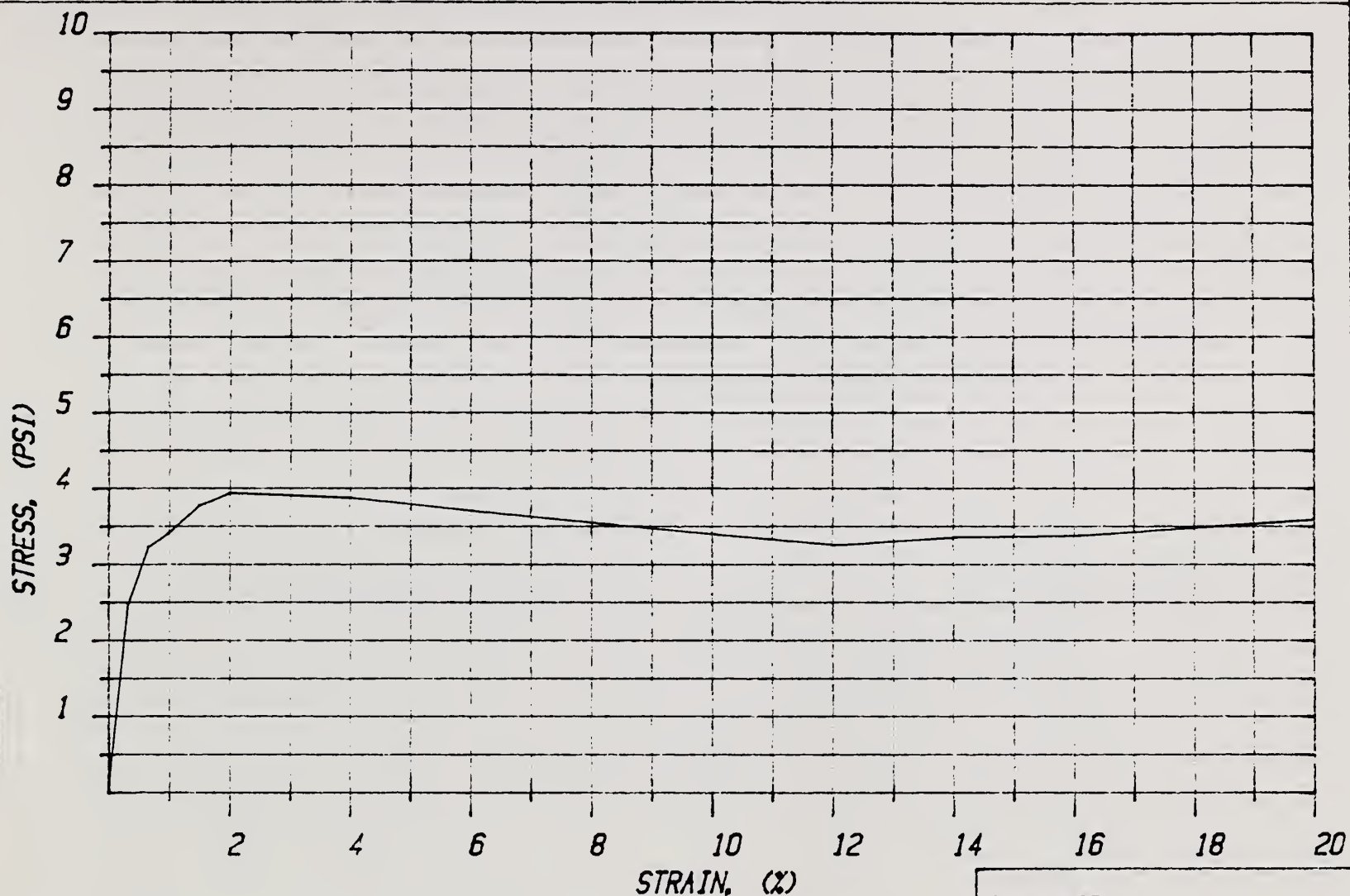


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C 102

PROJECT: WEPP - WALLA WALLA SOIL - PULLMAN WA.

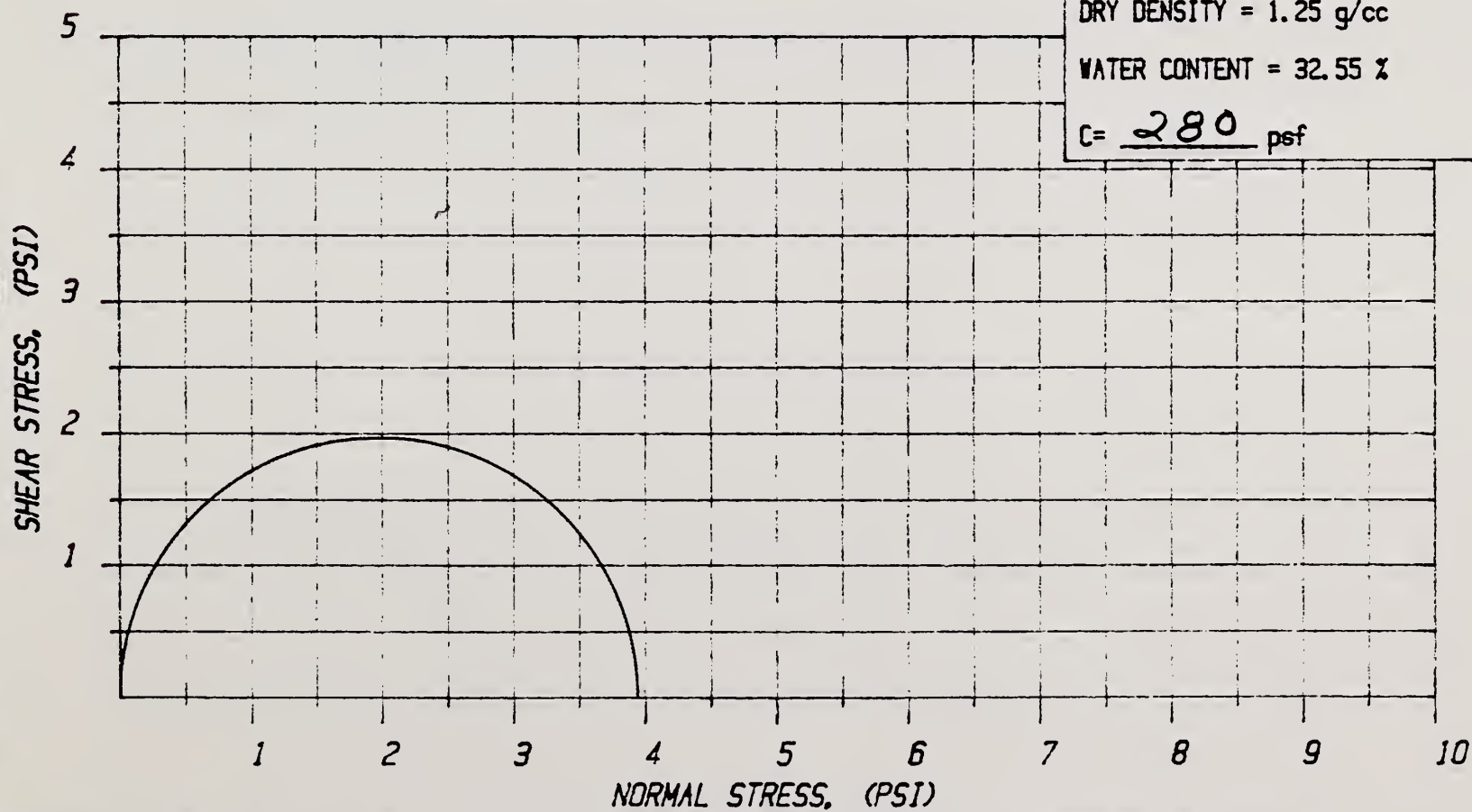


GS = 2.65

DRY DENSITY = 1.25 g/cc

WATER CONTENT = 32.55 %

C = 280 psf





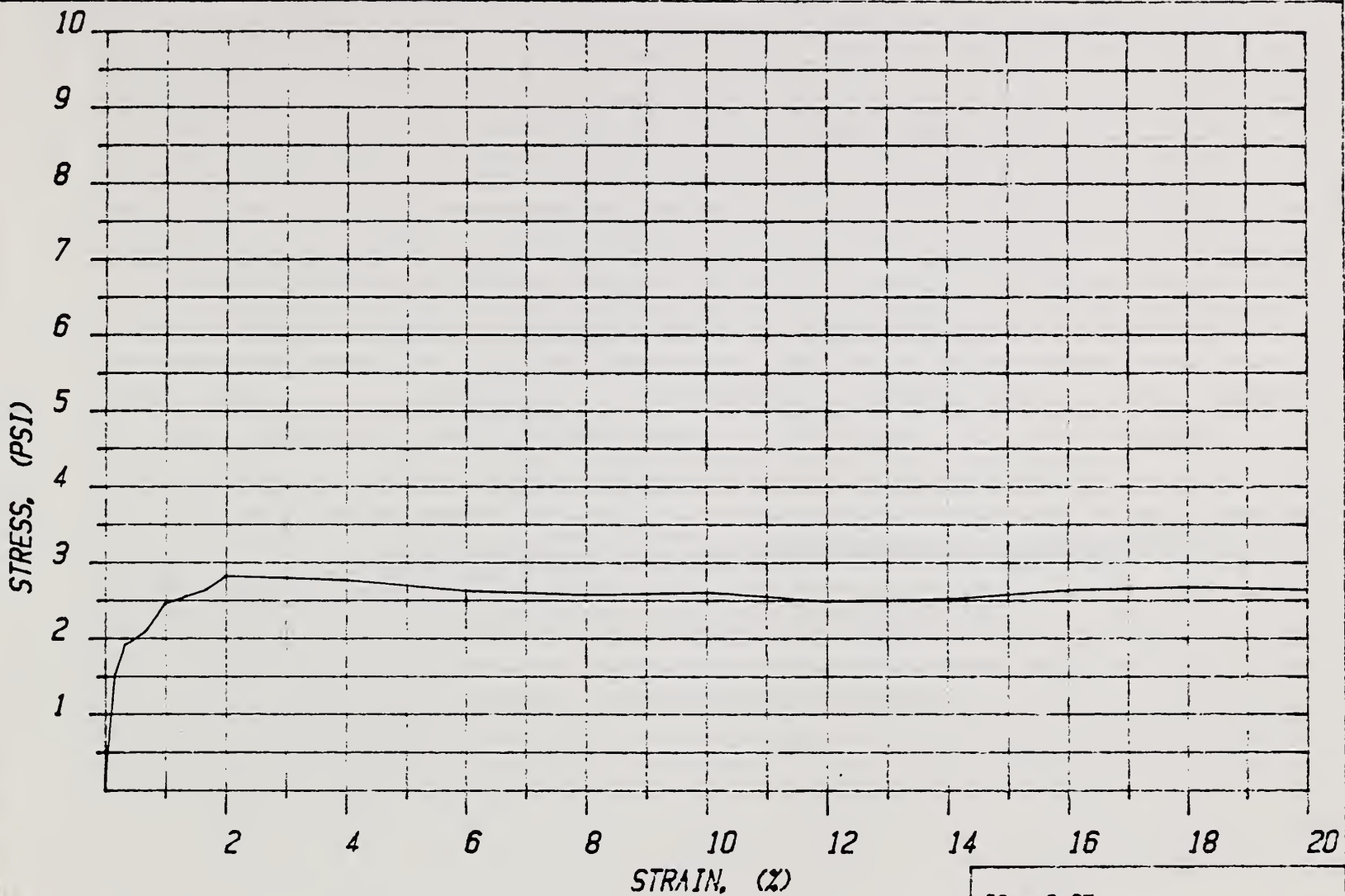


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C 103

PROJECT: WEPP - WHITNEY SOIL - FRESNO CA.

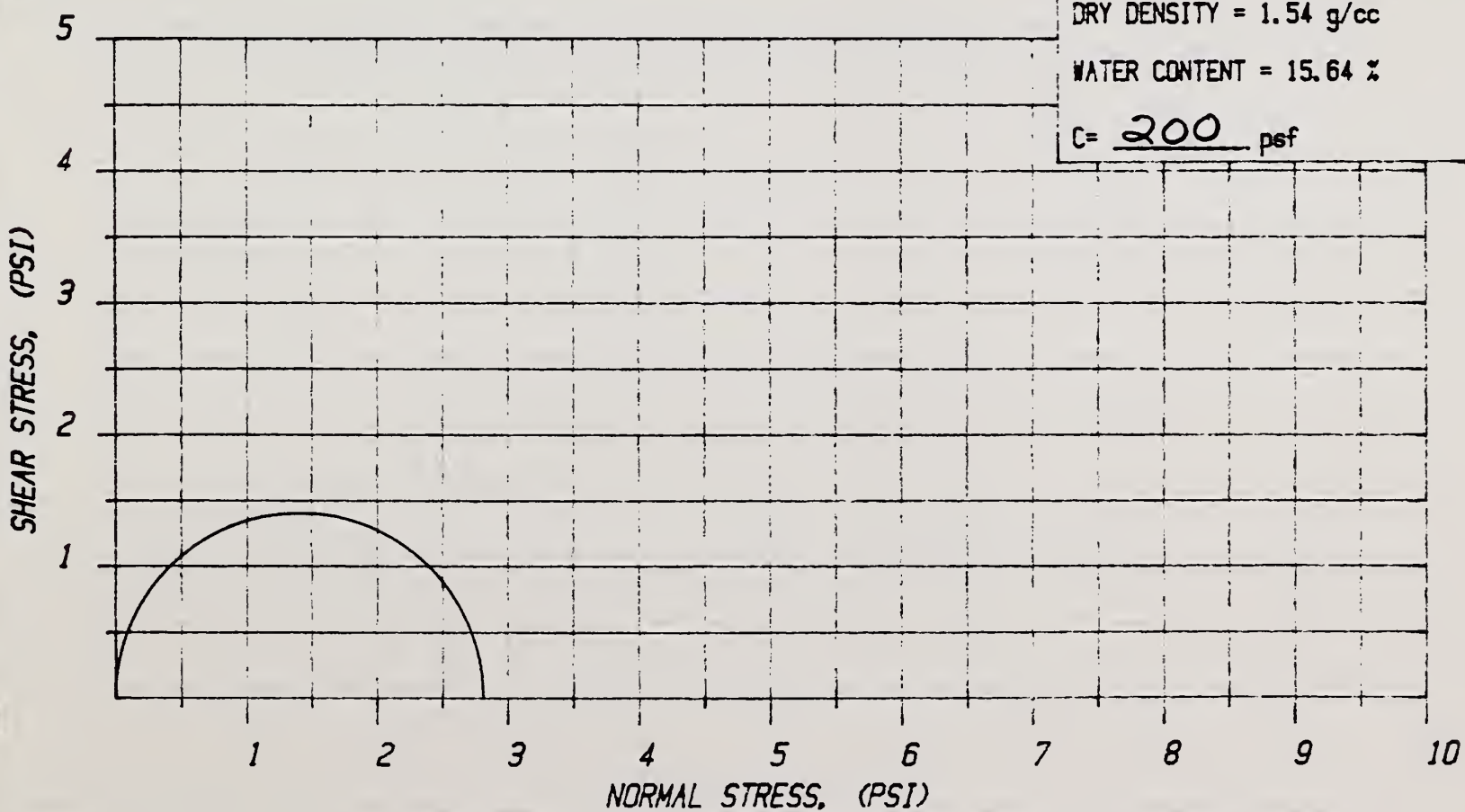


GS = 2.67

DRY DENSITY = 1.54 g/cc

WATER CONTENT = 15.64 %

C = 200 psf



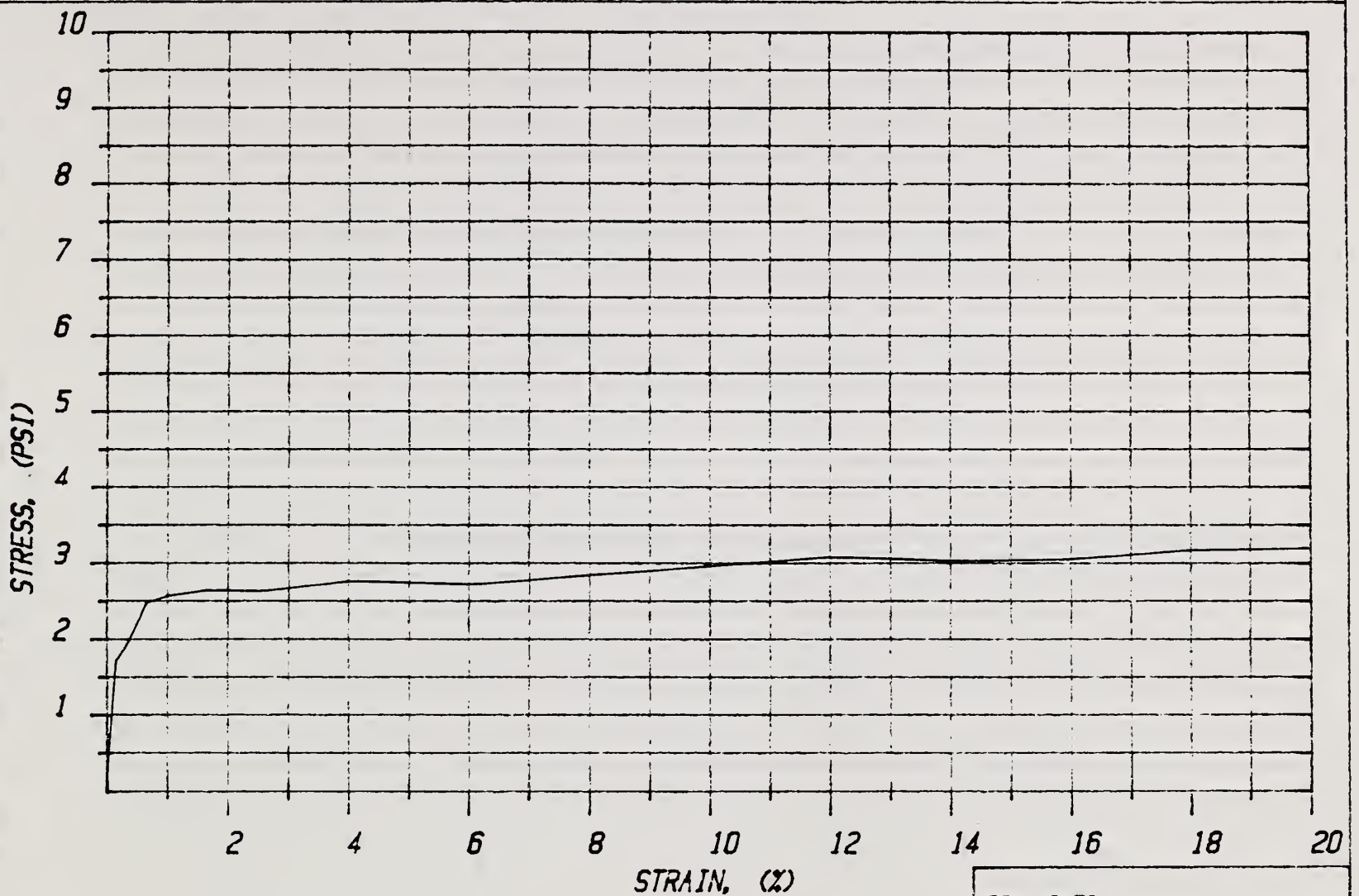


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C 104

PROJECT: WEPP - WILLIAMS SOIL - McCLUSKY ND.

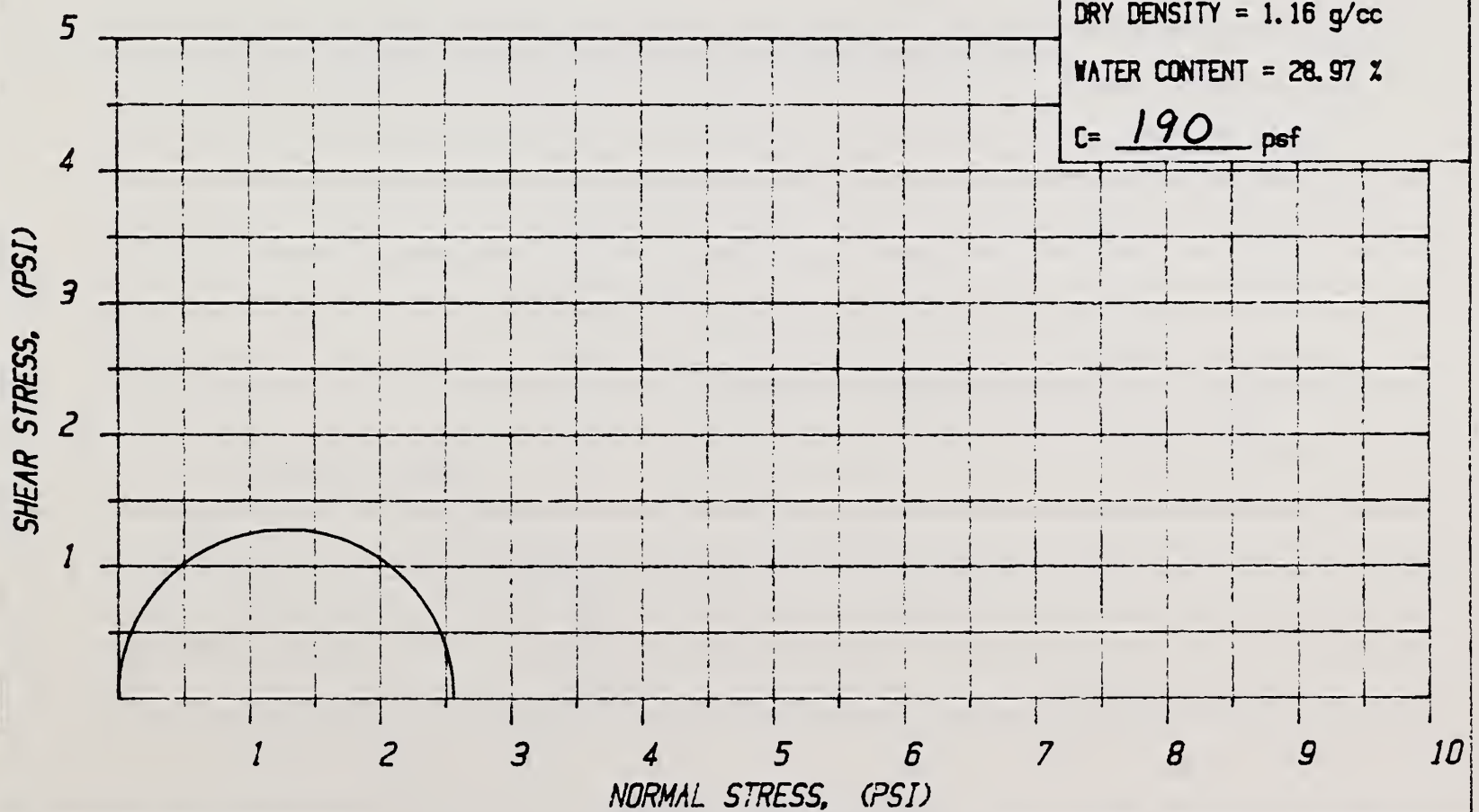


GS = 2.59

DRY DENSITY = 1.16 g/cc

WATER CONTENT = 28.97 %

C = 190 psf





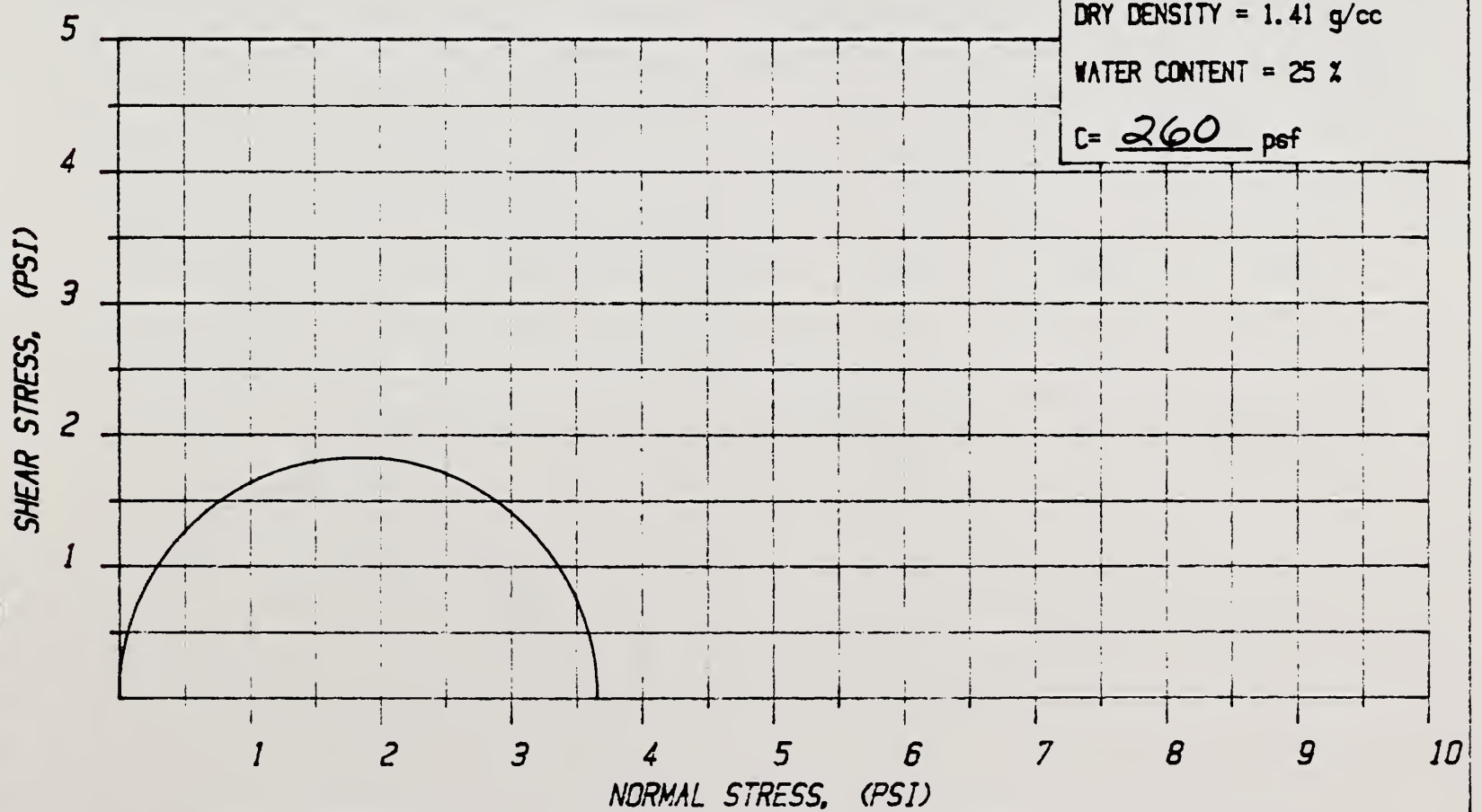
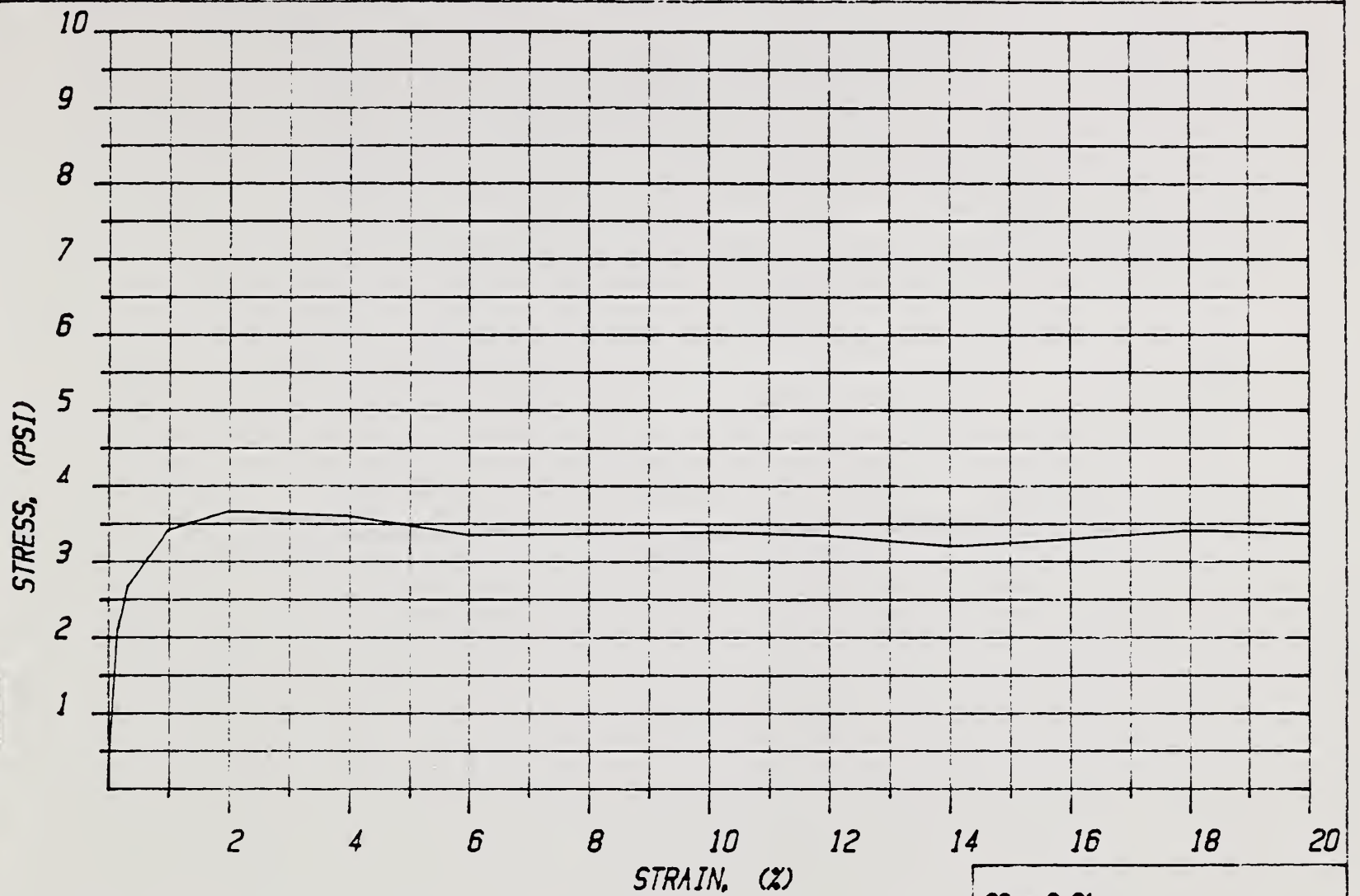


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C 105

PROJECT: WEPP - WOODWARD SOIL - OKLAHOMA



GS = 2.61

DRY DENSITY = 1.41 g/cc

WATER CONTENT = 25 %

C = 260 psf

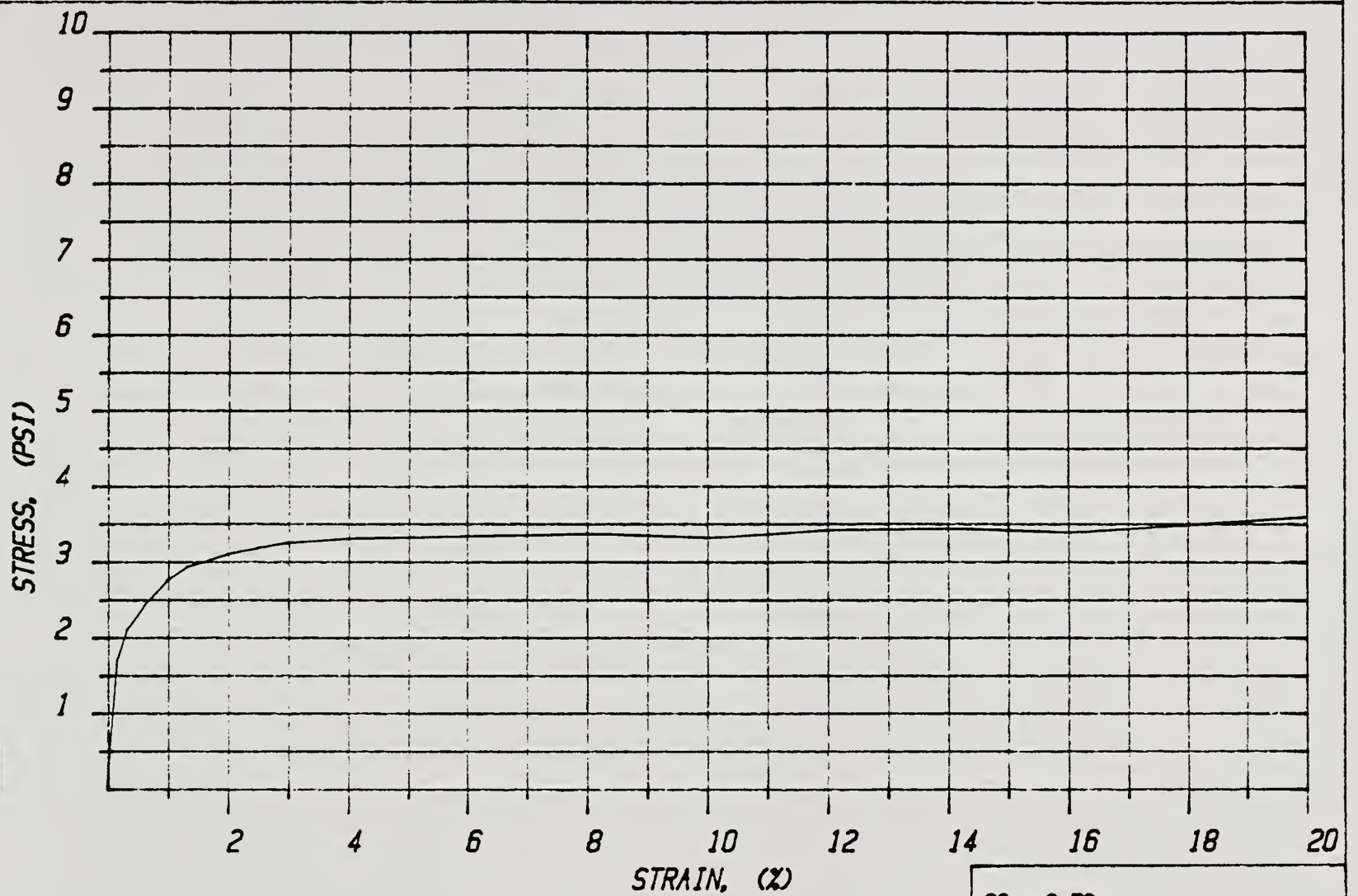


# UNCONFINED COMPRESSION TEST

SOIL MECHANICS LABORATORY, LINCOLN NE.

SAMPLE NO. 88C 106

PROJECT: WEPP - ZAHL SOIL - NORTH DAKOTA

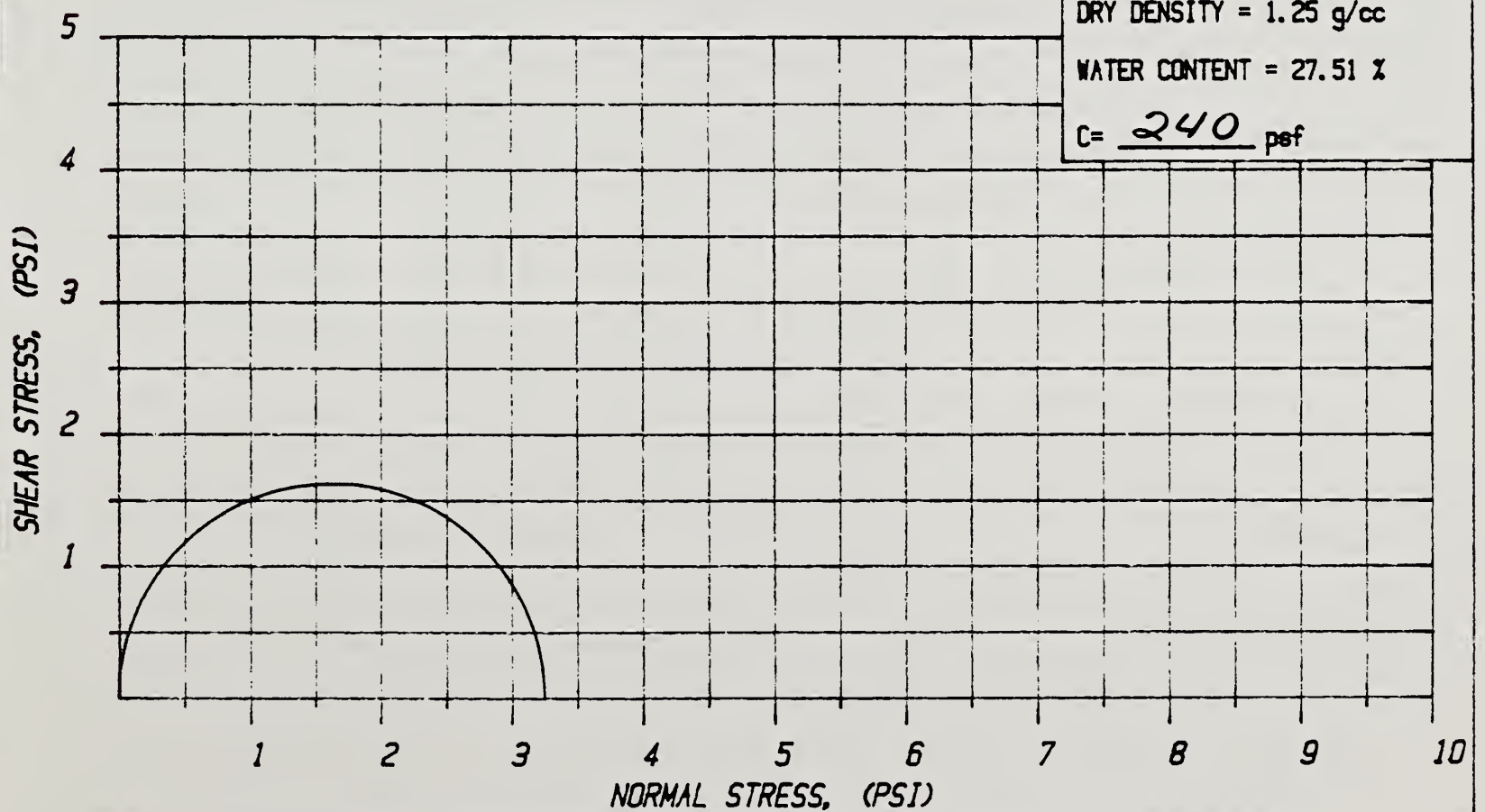


GS = 2.58

DRY DENSITY = 1.25 g/cc

WATER CONTENT = 27.51 %

C = 240 psf







Consolidation Test Data



# RESULTS OF CONSOLIDATION TEST

=====

*WEPP-Sample*

Project: ABILENE-TEXAS

Field number:

LAB. NUMBER 88C89

Sample depth: Feet

Sample description: REMOLDED TO 1.50 GMS/CC NON-PLASTIC SM SATURATED AT START OF TEST

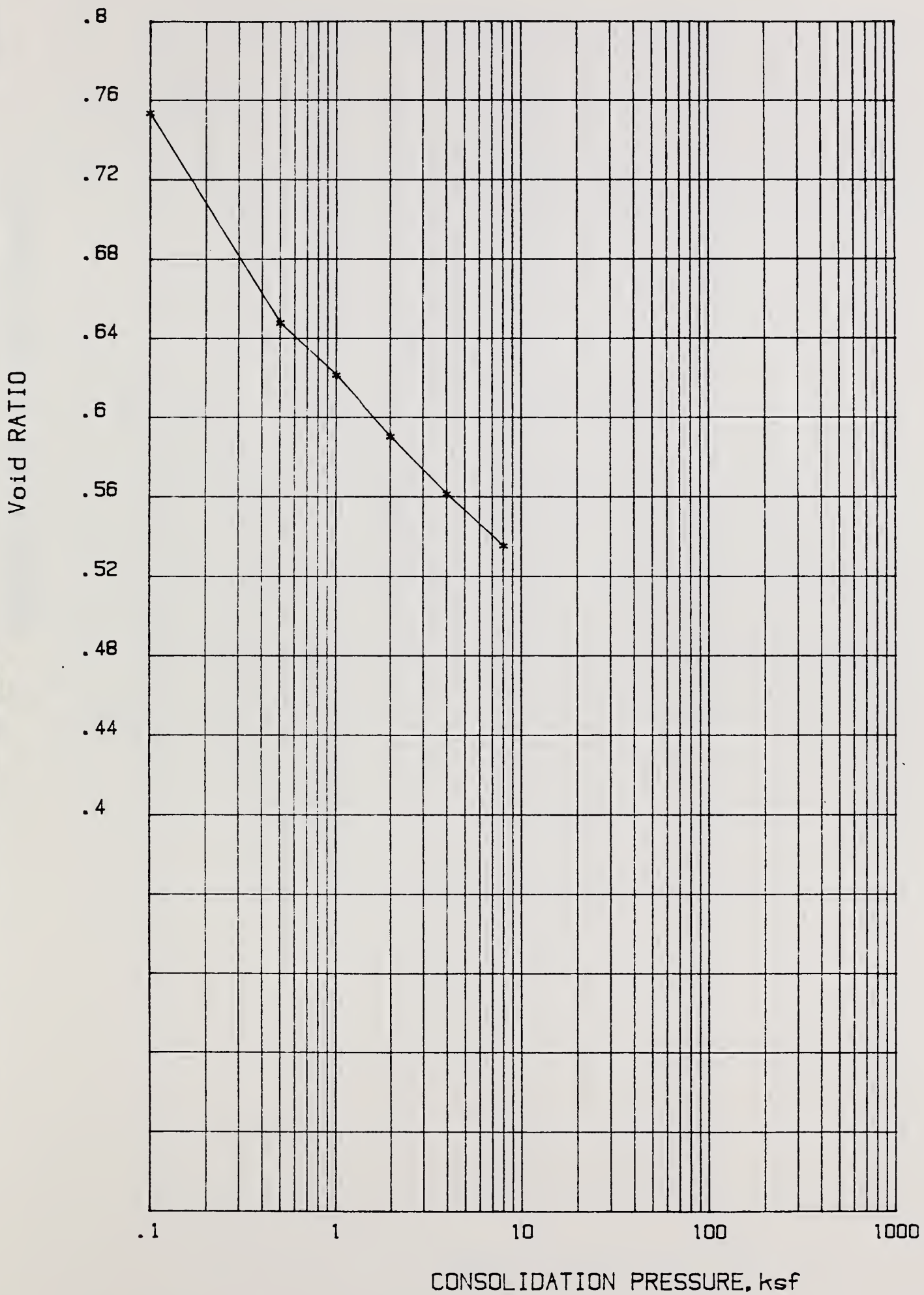
SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 129.27 g  
 INITIAL DRY WEIGHT: 120.66 g  
 INITIAL WATER CONTENT: 7.1 %  
 INITIAL WET DENSITY: 100.327 PCF  
 INITIAL DRY DENSITY: 93.645 PCF  
 SPECIFIC GRAVITY: 2.63  
 INITIAL VOID RATIO: .753

FINAL WET WEIGHT: 140.12 g  
 FINAL WATER CONTENT: 16.1 %

1. ELEMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
-----	-----	-----	-----	-----
1.0	.10	0.0000	.7530	0.00
2.0	.50	.0604	.6470	6.04
3.0	1.00	.0755	.6200	7.55
4.0	2.00	.0933	.5890	9.33
5.0	4.00	.1098	.5600	10.98
6.0	8.00	.1247	.5340	12.47







Project: ABILENE-TEXAS

LAB. NUMBER 88C89

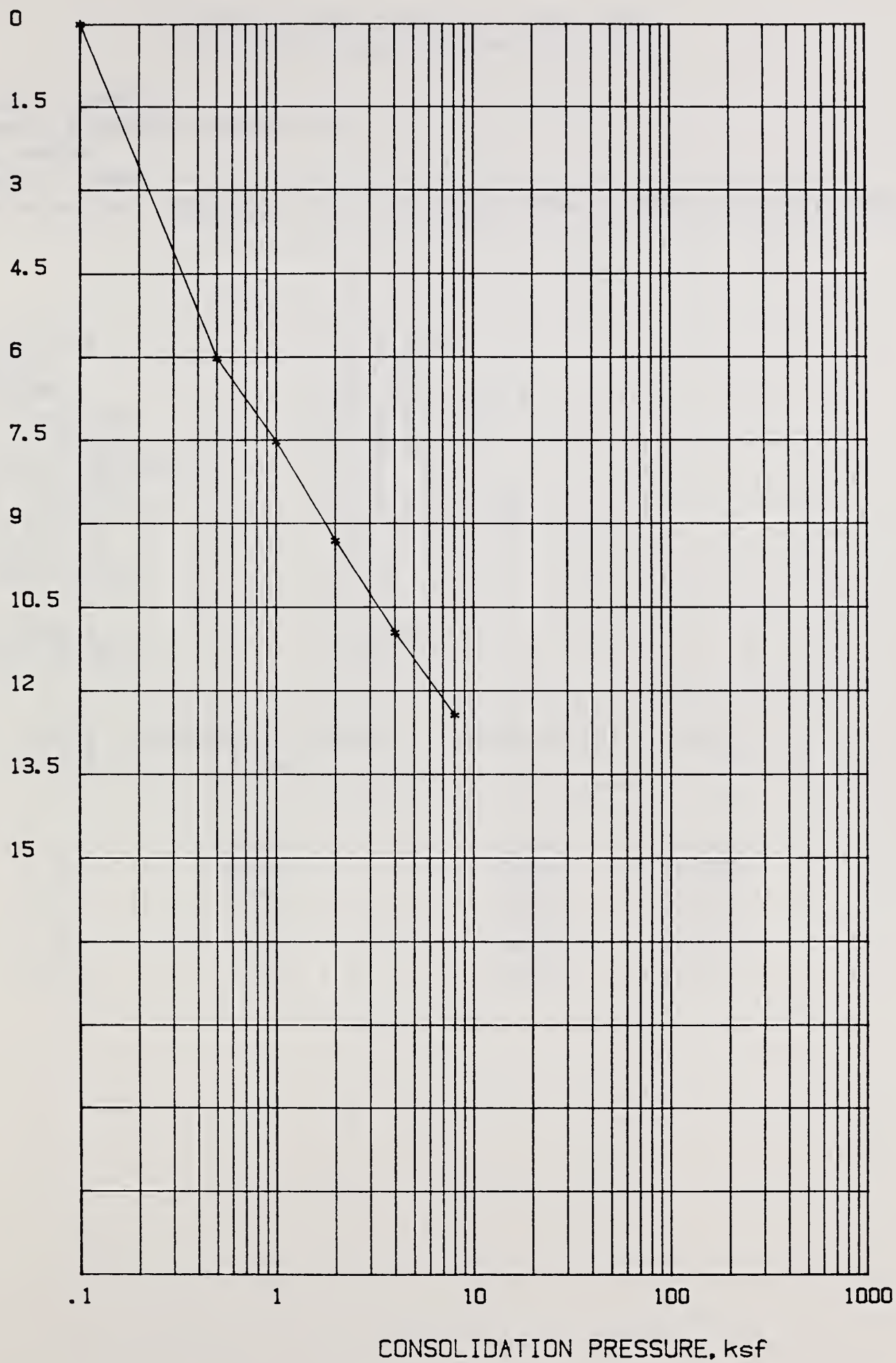
Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



PERCENT CONSOLIDATION-LAB. SAMPLE,



Project: ABILENE-TEXAS

LAB. NUMBER 88C89

Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.





# RESULTS OF CONSOLIDATION TEST

=====

Project: WEPP SAMPLE

Field number: ACADEMY-FRESNO CA.

LAB. NUMBER 88C90

Sample depth: Feet

Sample description: REMOLDED TO 1.61 GM/CC NON-PLASTIC SM SATURATED AT START OF TEST

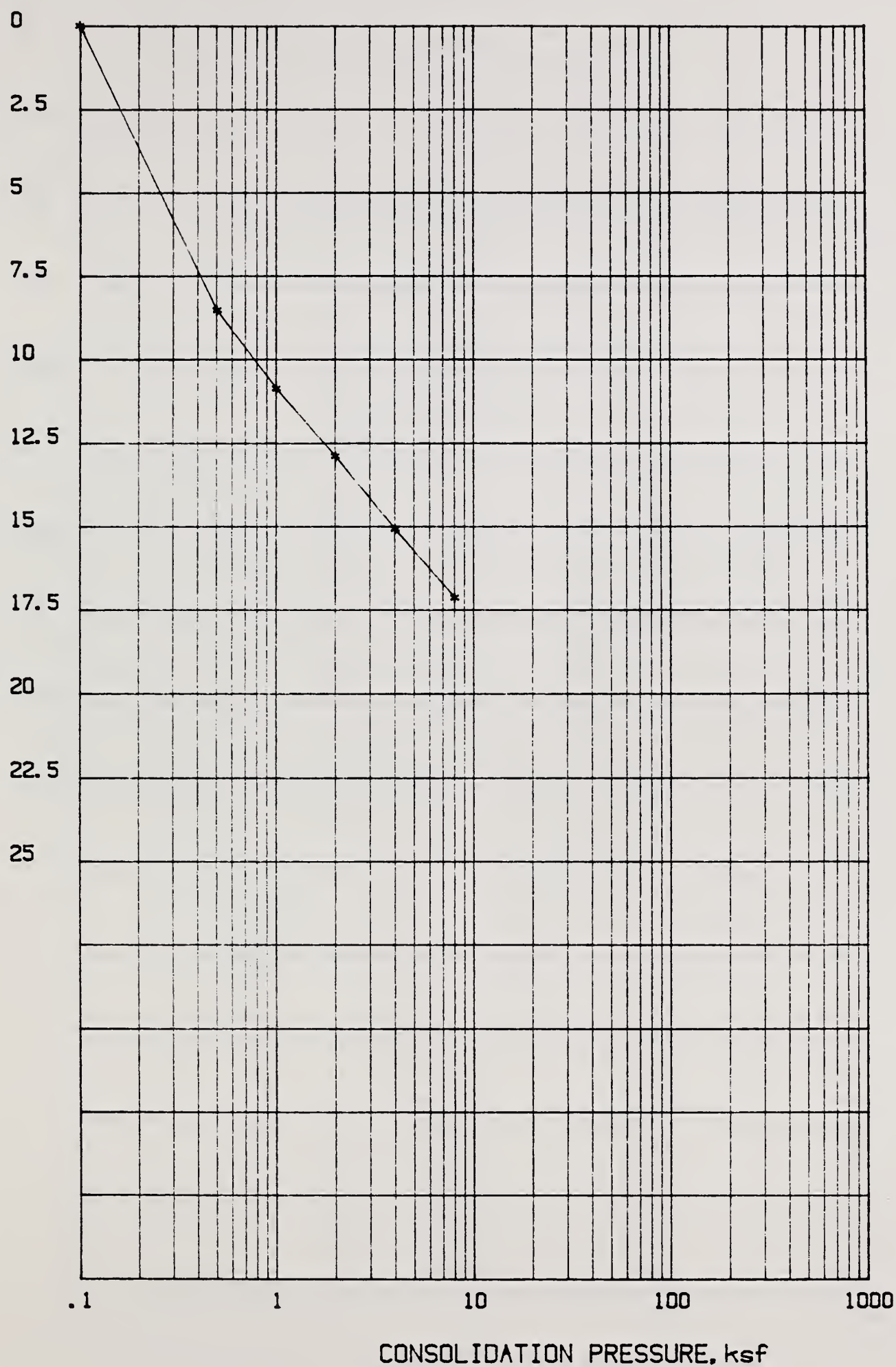
SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 133.44 g  
 INITIAL DRY WEIGHT: 128.88 g  
 INITIAL WATER CONTENT: 3.5 %  
 INITIAL WET DENSITY: 103.563 PCF  
 INITIAL DRY DENSITY: 100.024 PCF  
 SPECIFIC GRAVITY: 2.75  
 INITIAL VOID RATIO: .716

FINAL WET WEIGHT: 146.86 g  
 FINAL WATER CONTENT: 13.9 %

LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%	
1.0	.10	0.0000	.7160	0.00
2.0	.50	.0855	.5690	8.55
3.0	1.00	.1090	.5290	10.90
4.0	2.00	.1292	.4940	12.92
5.0	4.00	.1511	.4570	15.11
6.0	8.00	.1717	.4210	17.17



PERCENT CONSOLIDATION-LAB. SAMPLE.



Project: WEPP SAMPLE

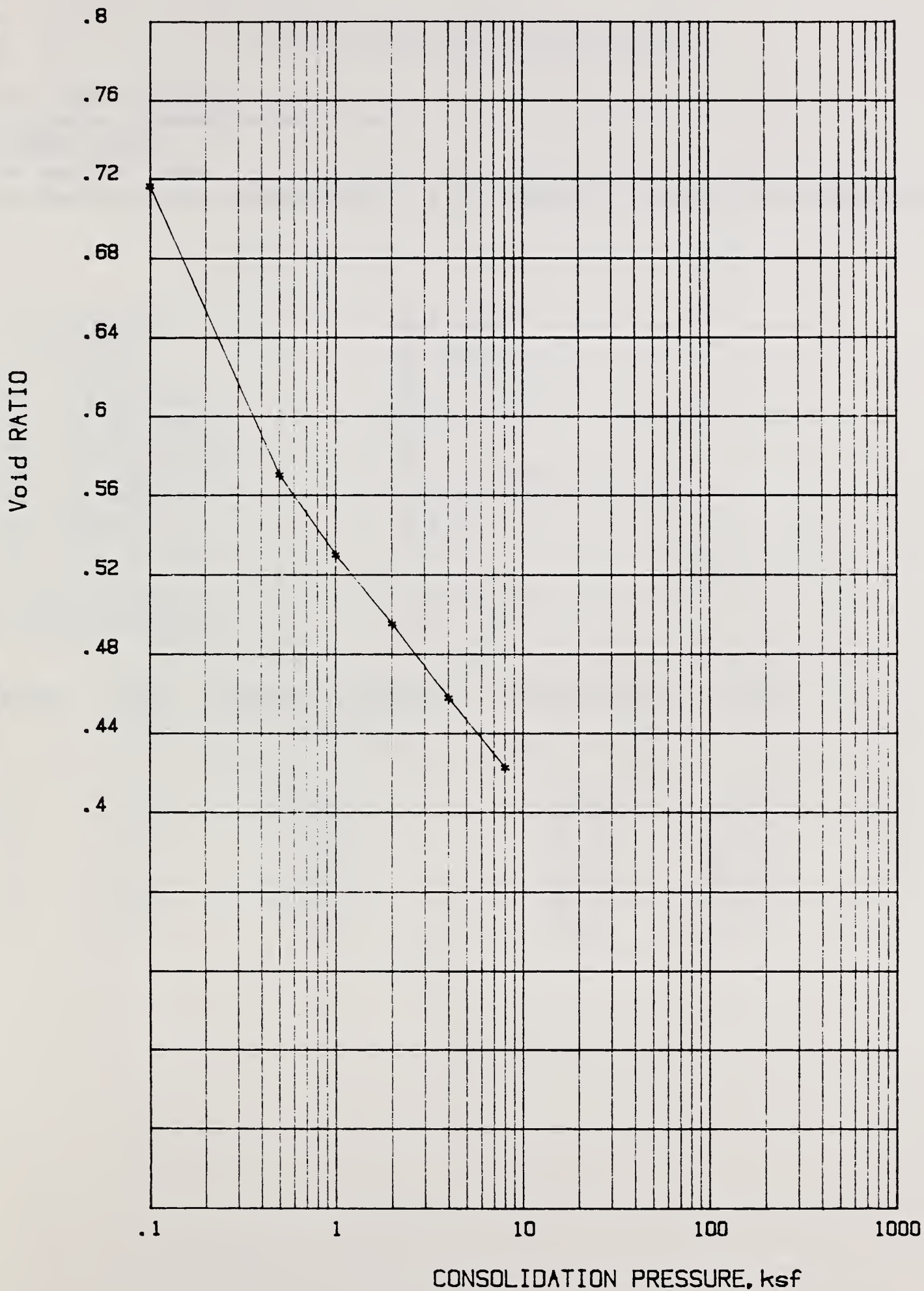
LAB. NUMBER 88C90

Field number: ACADEMY-FRESNO CA. Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.







Project: WEPP SAMPLE

LAB. NUMBER 88C90

Field number: ACADEMY-FRESNO CA. Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



# RESULTS OF CONSOLIDATION TEST

=====

Project: WEPP SAMPLE

Field number: BARNES-MORRIS MN.

LAB. NUMBER 88C91

Sample depth: Feet

Sample description: COMPACTED TO 1.14 GM/CC CL LL=26 PI=9 SATURATED AT START OF TEST

SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 100 g  
 INITIAL DRY WEIGHT: 92.34 g  
 INITIAL WATER CONTENT: 8.2 %  
 INITIAL WET DENSITY: 77.61 PCF  
 INITIAL DRY DENSITY: 71.665 PCF  
 SPECIFIC GRAVITY: 2.61  
 INITIAL VOID RATIO: 1.273

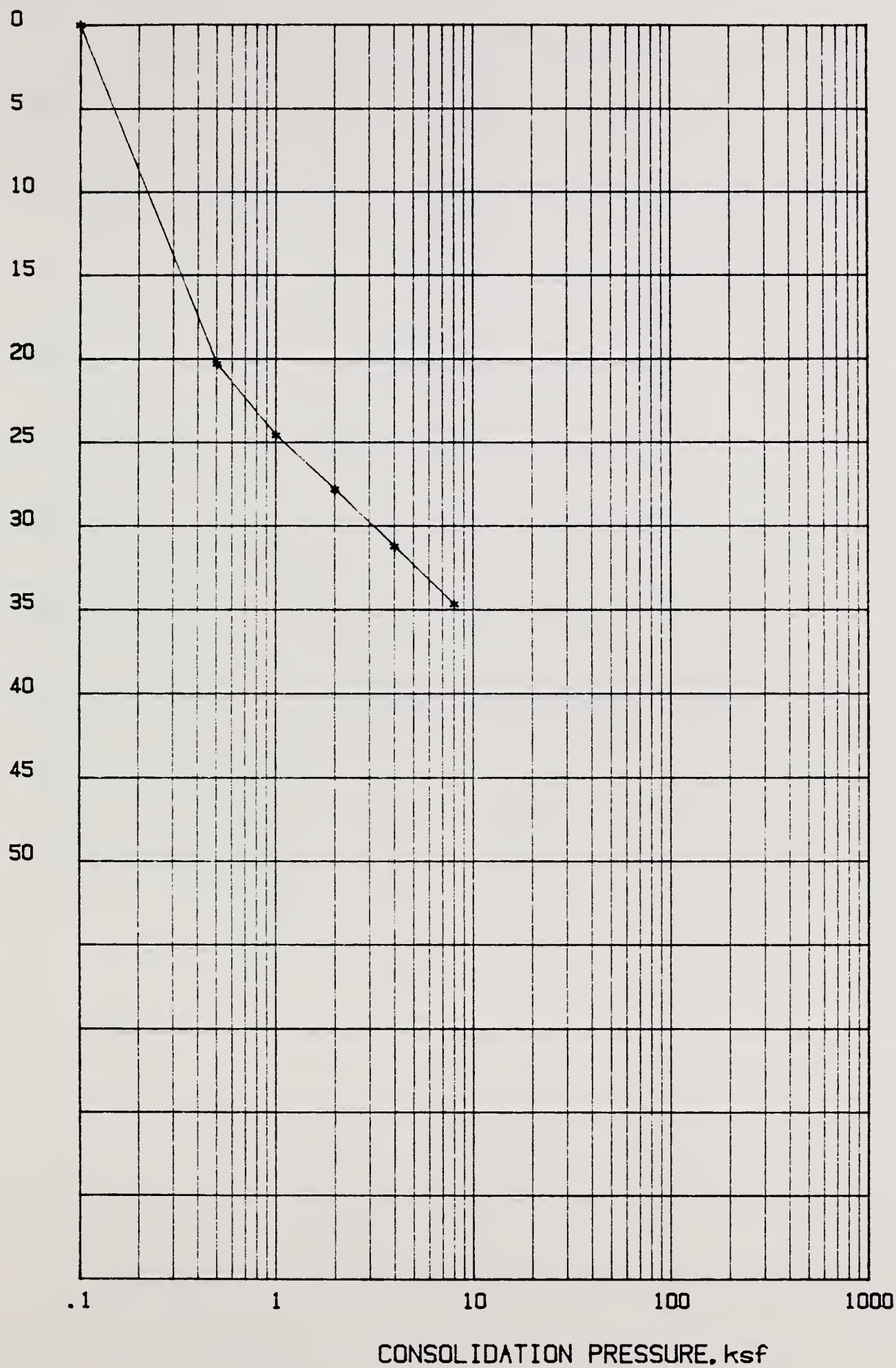
FINAL WET WEIGHT: 109.66 g  
 FINAL WATER CONTENT: 18.7 %

1. ELEMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
-----	-----	-----	-----	-----
1.0	.10	0.0000	1.2730	0.00
2.0	.50	.2034	.8110	20.34
3.0	1.00	.2463	.7130	24.63
4.0	2.00	.2787	.6390	27.87
5.0	4.00	.3130	.5610	31.30
6.0	8.00	.3477	.4830	34.77





PERCENT CONSOLIDATION-LAB. SAMPLE.



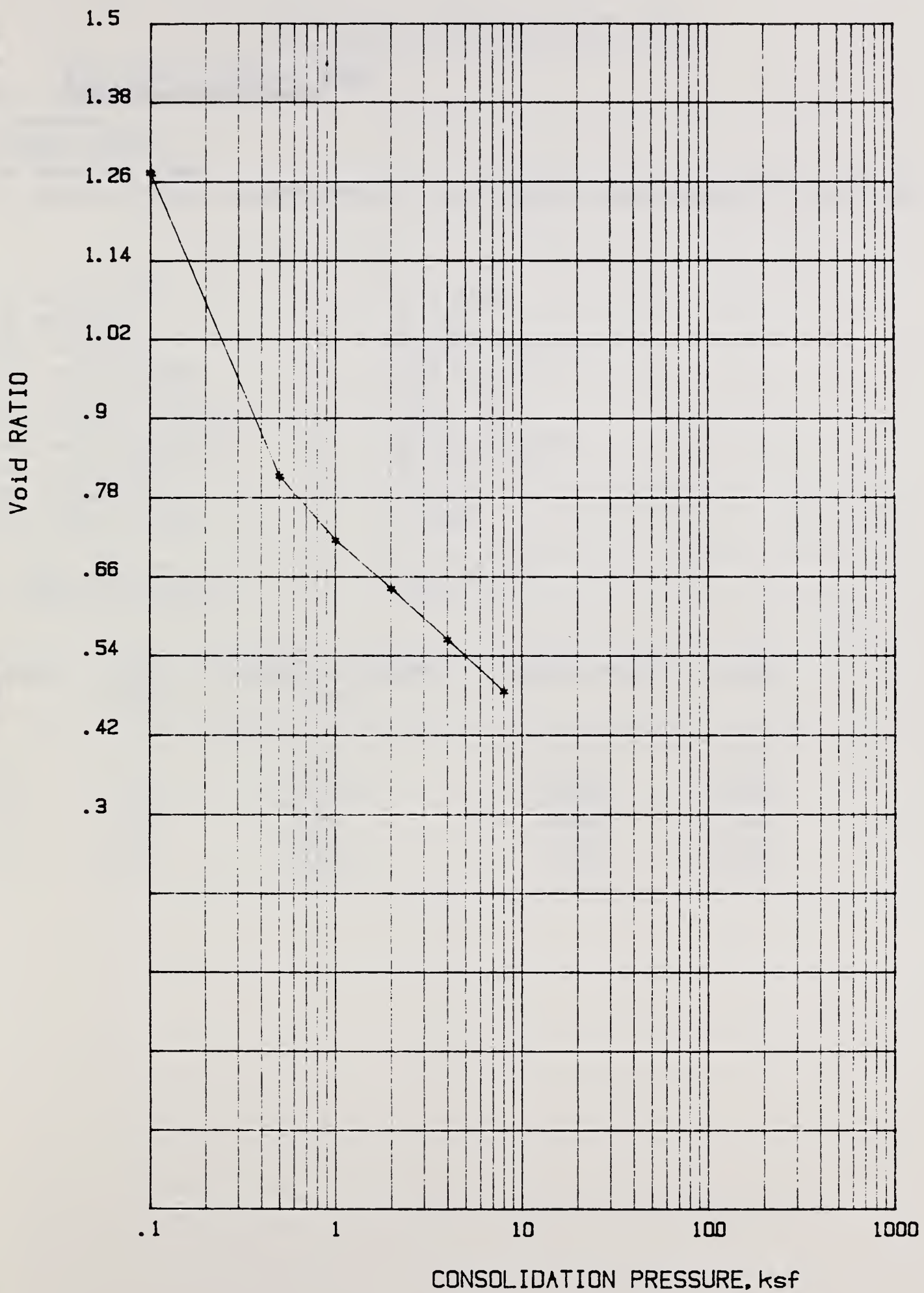
Project: WEPP SAMPLE

LAB. NUMBER 88C91

Field number: BARNES-MORRIS MN. Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





Project: WEPP SAMPLE

LAB. NUMBER 88C91

Field number: BARNES-MORRIS MN. Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





## RESULTS OF CONSOLIDATION TEST

=====

Project: Barnes, Morris MN.

Field number:

LAB. NUMBER 88C91

Sample depth: Feet

Sample description: COMPACTED TO 1.14 GMS/CC SATURATED AT START OF TEST

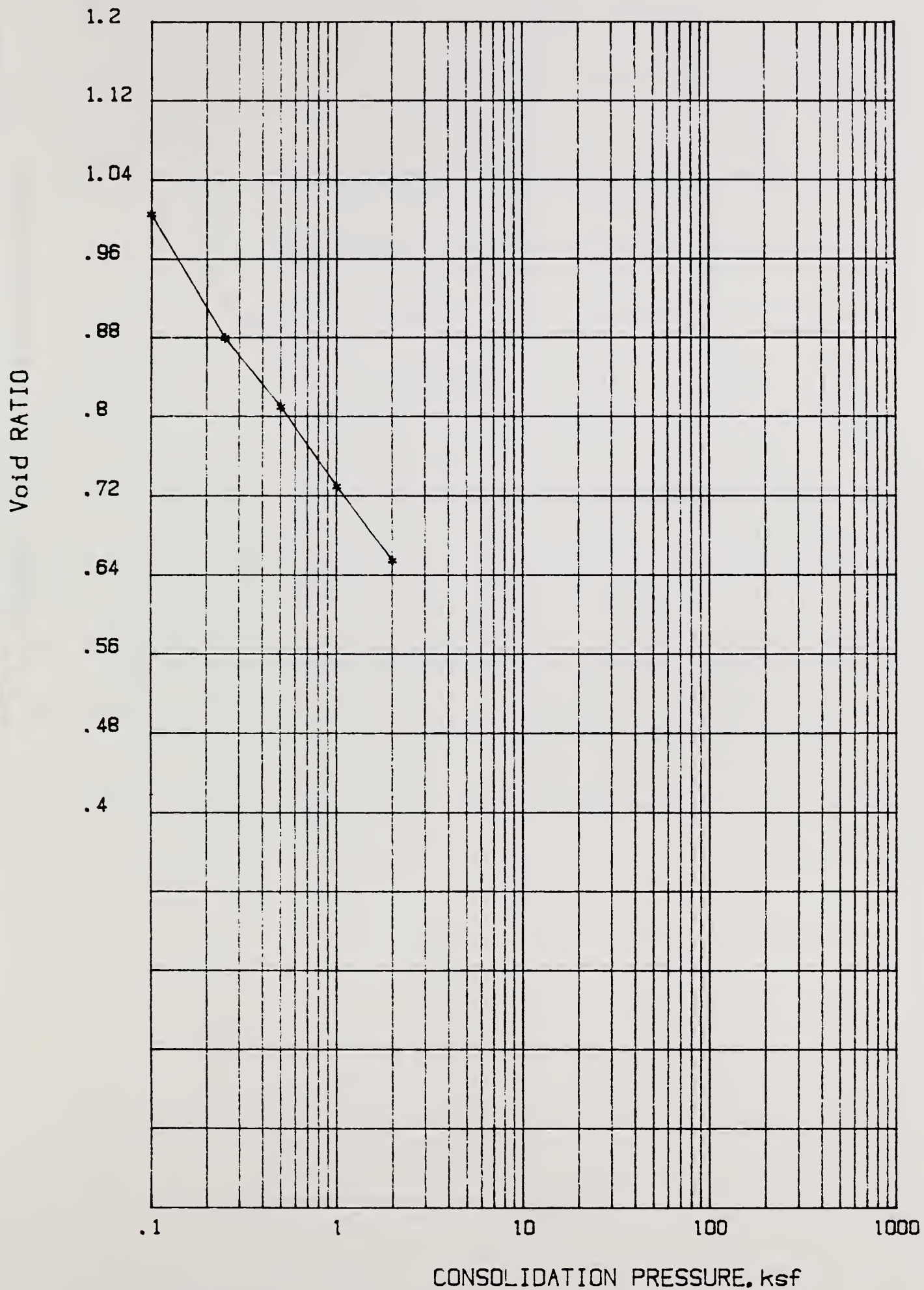
SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 104.25 g  
 INITIAL DRY WEIGHT: 91.7 g  
 INITIAL WATER CONTENT: 13.6 %  
 INITIAL WET DENSITY: 80.909 PCF  
 INITIAL DRY DENSITY: 71.169 PCF  
 SPECIFIC GRAVITY: 2.61  
 INITIAL VOID RATIO: 1.289

FINAL WET WEIGHT: 113.66 g  
 FINAL WATER CONTENT: 23.9 %

LOAD (ksf)	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	1.0040	12.43
2.0	.25	.8780	17.94
3.0	.50	.8080	21.01
4.0	1.00	.7280	24.51
5.0	2.00	.6530	27.79



Test 2



Project: Barnes Soil MN.  
Field number:                       
USDA-SCS S.M.L. LINCOLN NE.

LAB. NUMBER 88C91

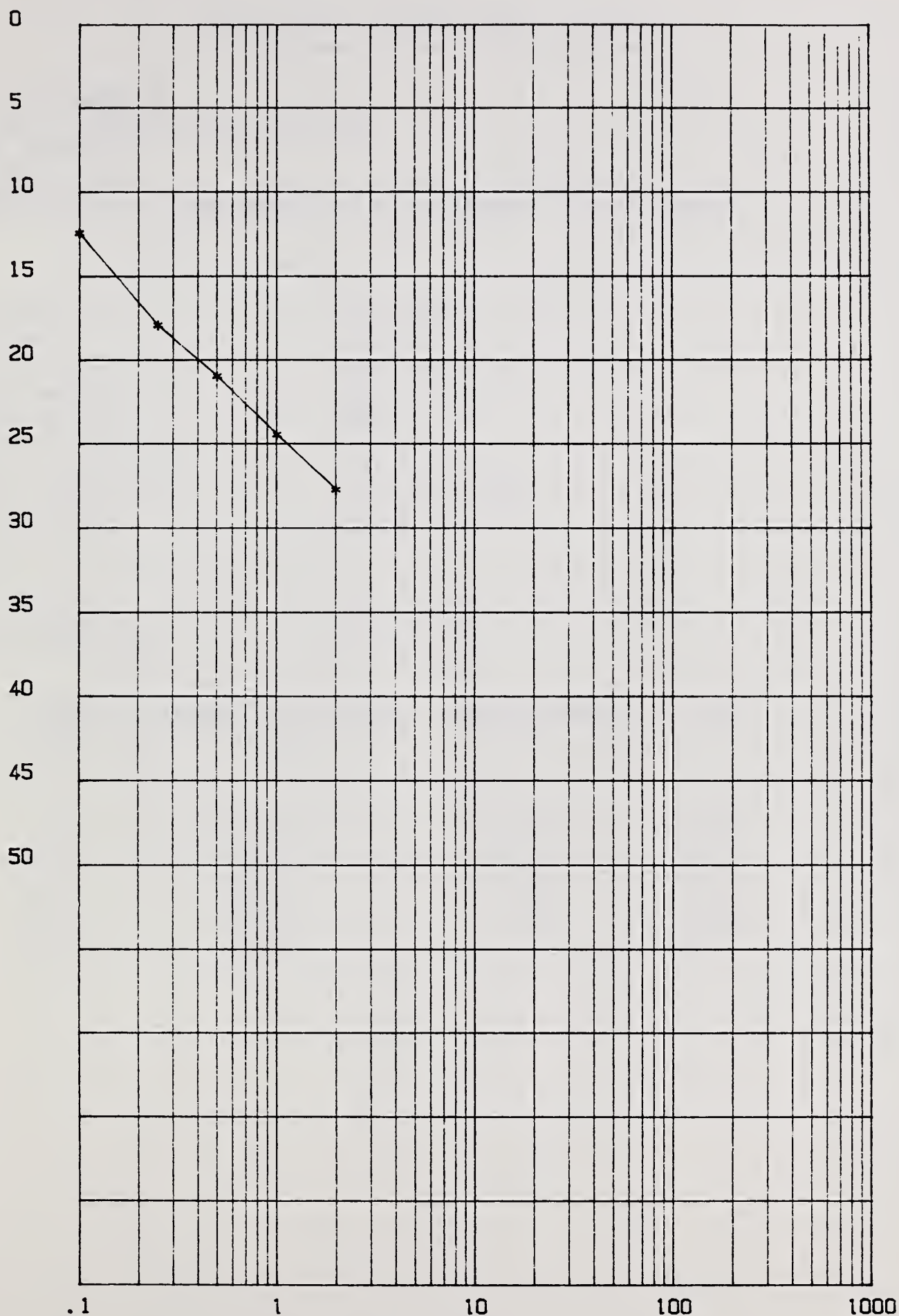
Sample depth: Feet





Test 2

PERCENT CONSOLIDATION-LAB. SAMPLE.



CONSOLIDATION PRESSURE, ksf

Project: Barnes Soil MN.

LAB. NUMBER 88C91

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



# RESULTS OF CONSOLIDATION TEST

=====

Project: WEPP SAMPLE

Field number: BARNES-McCLUSKY ND.

LAB. NUMBER 88C92

Sample depth: Feet

Sample description: COMPACTED TO 1.20 GM/CC LL=31 PI=12

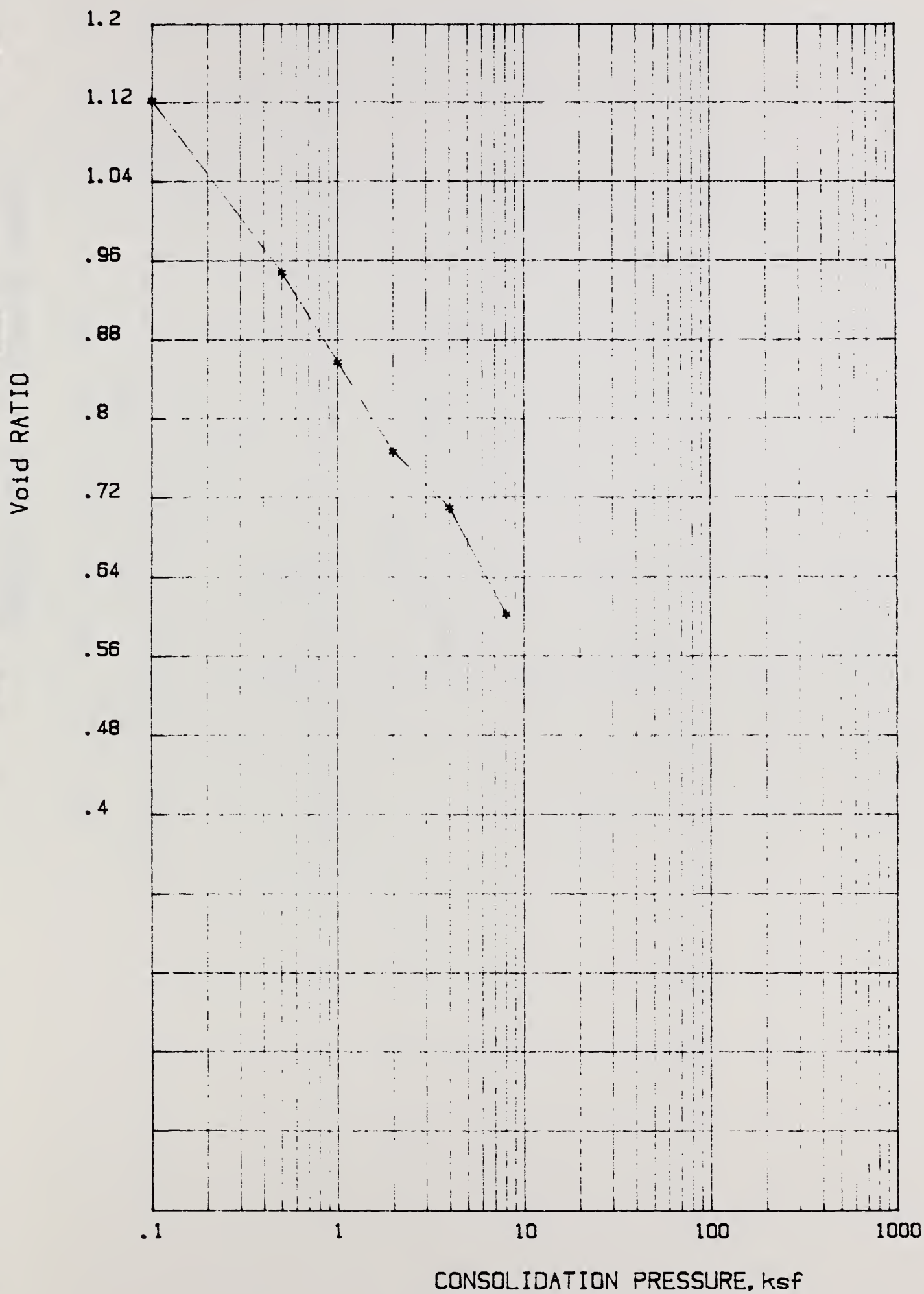
SAMPLE DIAMETER: 2.5 ins  
 SAMP'LE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 104.23 g  
 INITIAL DRY WEIGHT: 96.67 g  
 INITIAL WATER CONTENT: 7.8 %  
 INITIAL WET DENSITY: 80.893 PCF  
 INITIAL DRY DENSITY: 75.026 PCF  
 SPECIFIC GRAVITY: 2.55  
 INITIAL VOID RATIO: 1.121

FINAL WET WEIGHT: 108.14 g  
 FINAL WATER CONTENT: 11.8 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	0.0000	1.1210	0.00
2.0	.50	.0823	.9470	8.23
3.0	1.00	.1252	.8560	12.52
4.0	2.00	.1681	.7650	16.81
5.0	4.00	.1948	.7080	19.48
6.0	8.00	.2454	.6010	24.54







Project: WEPP SAMPLE

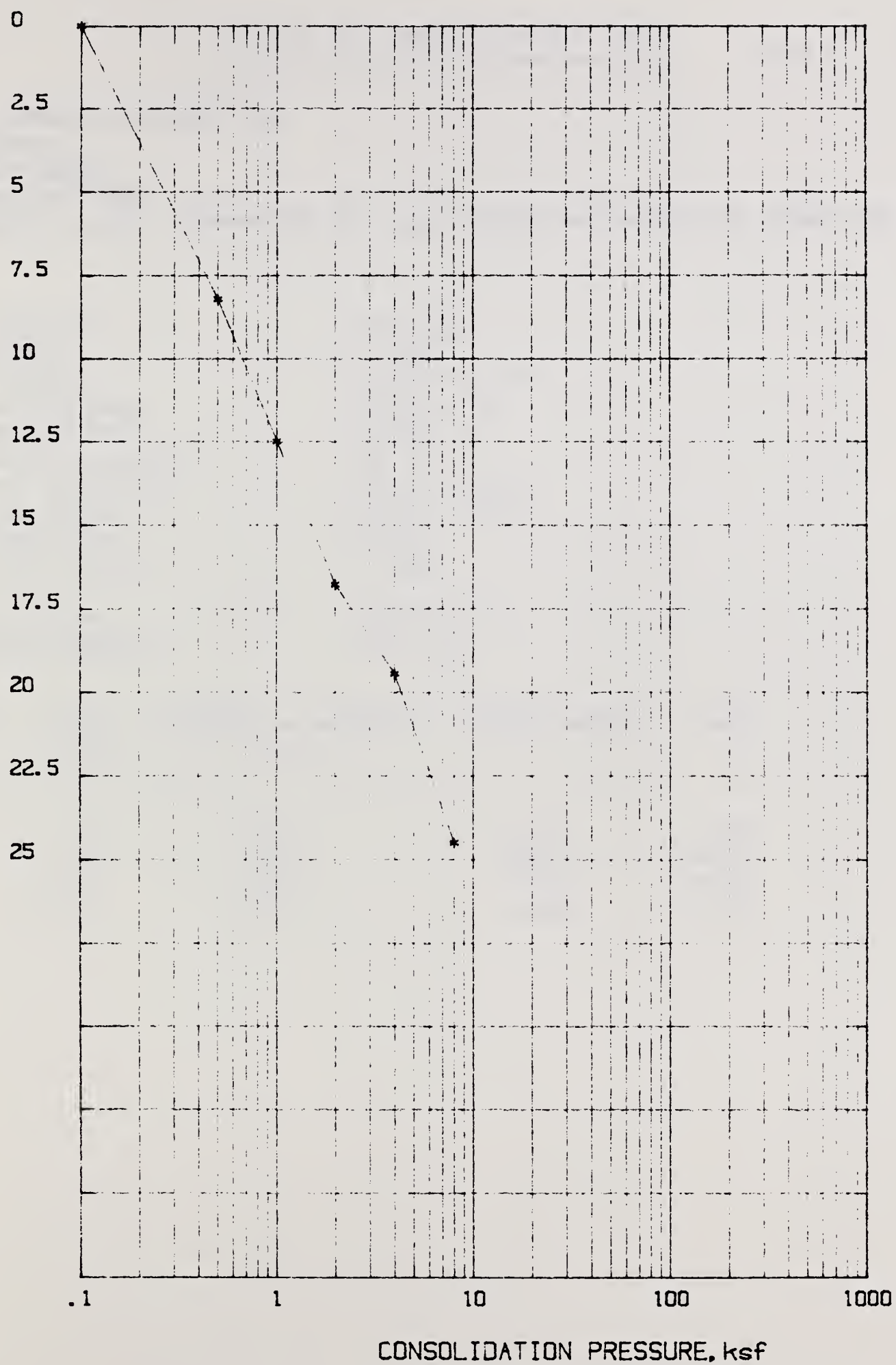
LAB. NUMBER 88C92

Field number: BARNES-McCLUSKY ND. Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



PERCENT CONSOLIDATION-LAB. SAMPLE.



Project: WEPP SAMPLE

LAB. NUMBER 88C92

Field number: BARNES-McCLUSKY ND. Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.

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# RESULTS OF CONSOLIDATION TEST

Test #2

Project: BARNES-McCLUSKY ND.

Field number:

LAB. NUMBER 88C92

Sample depth: Feet

Sample description: COMPACTED TO 1.20 GM/CC SATURATED AT START OF TEST

SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 108.16 g  
 INITIAL DRY WEIGHT: 96.52 g  
 INITIAL WATER CONTENT: 12 %  
 INITIAL WET DENSITY: 83.943 PCF  
 INITIAL DRY DENSITY: 74.909 PCF  
 SPECIFIC GRAVITY: 2.55  
 INITIAL VOID RATIO: 1.125

FINAL WET WEIGHT: 122.96 g  
 FINAL WATER CONTENT: 27.3 %

LEMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	.0425	1.0340	4.25
2.0	.50	.1400	.8270	14.00
3.0	1.00	.1789	.7440	17.89
4.0	2.00	.2210	.6550	22.10

1. The first part of the document is a letter from the President of the United States to the Congress.

It is dated the 1st of January, 1801, and is addressed to the Senate and House of Representatives.

The President informs the Congress that he has the honor to acknowledge the receipt of their letter of the 22d of December last, and that he is sensible of the importance of the subject which they have presented to him.

He then proceeds to state the measures which he has taken in relation to the subject, and concludes by expressing his confidence in the wisdom and justice of the measures which he has taken.

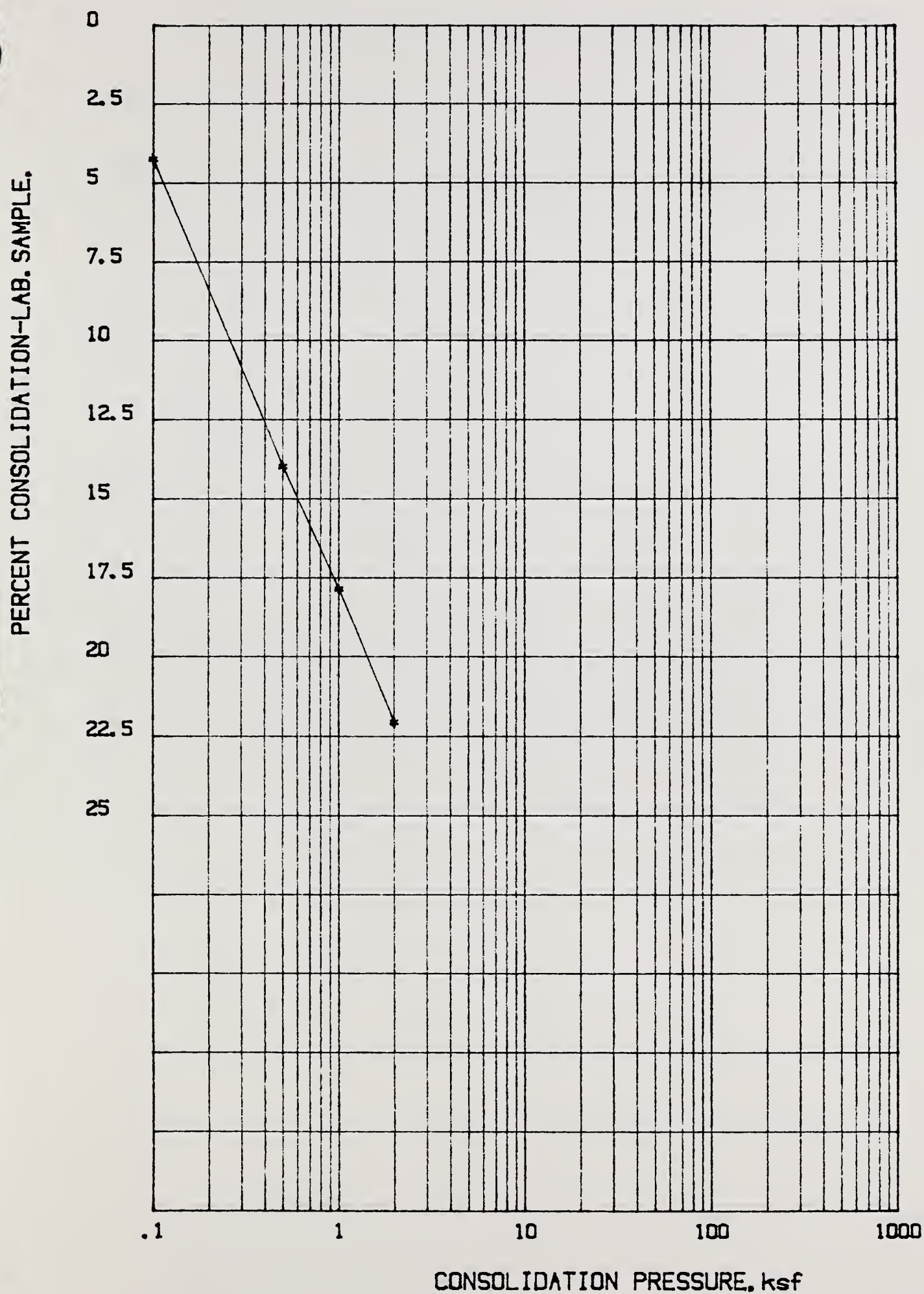
The second part of the document is a report from the Secretary of the Treasury, dated the 1st of January, 1801.

The report contains a statement of the receipts and disbursements of the Treasury for the year 1800, and a statement of the state of the Treasury at the end of the year.

The third part of the document is a report from the Secretary of the Navy, dated the 1st of January, 1801.

The report contains a statement of the receipts and disbursements of the Navy for the year 1800, and a statement of the state of the Navy at the end of the year.

Test No. 2



Project: BARNES-McCLUSKY ND.

LAB. NUMBER 88C92

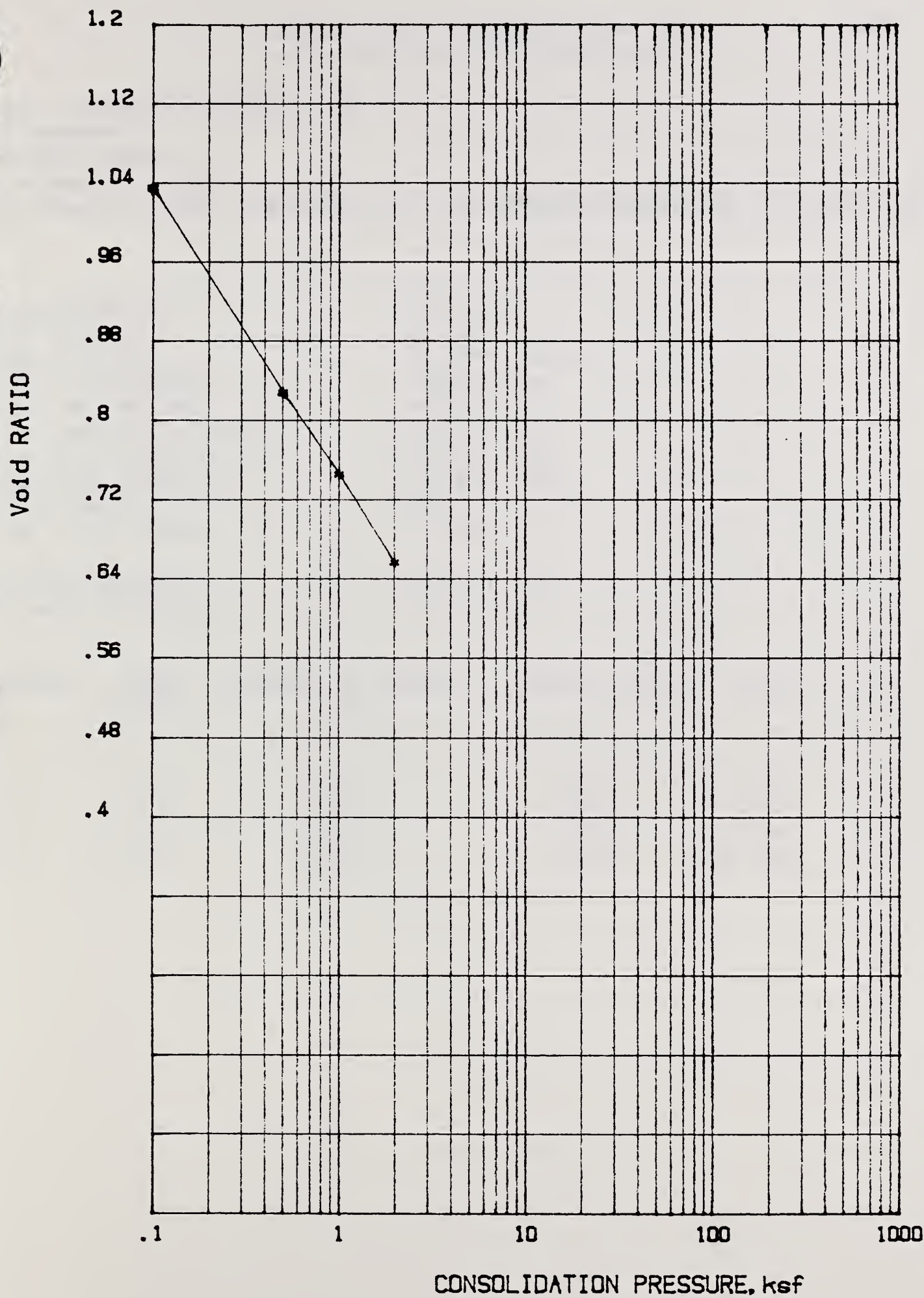
Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.







Project: BARNES-McCLUSKY ND.

LAB. NUMBER 88C92

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



# RESULTS OF CONSOLIDATION TEST

Test #3

Project: BARNES--McCLUSKY ND

Field number:

LAB.NUMBER 88C92

Sample depth: Feet

Sample description: COMPATED TO 1.20 GMS/CC SATURATED AT START OF TEST

SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 108.04 g  
 INITIAL DRY WEIGHT: 96.52 g  
 INITIAL WATER CONTENT: 11.9 %  
 INITIAL WET DENSITY: 83.85 PCF  
 INITIAL DRY DENSITY: 74.909 PCF  
 SPECIFIC GRAVITY: 2.55  
 INITIAL VOID RATIO: 1.125

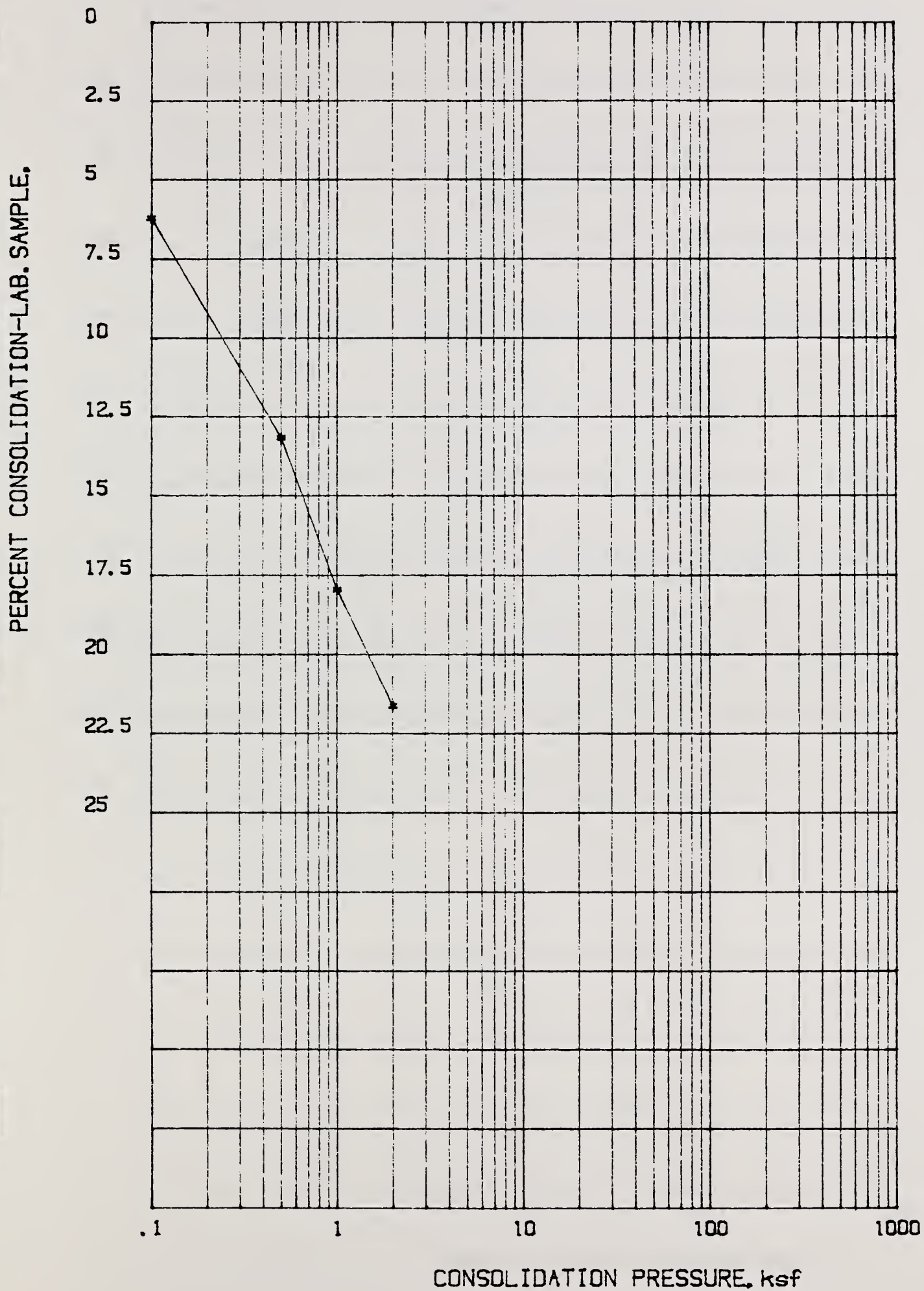
FINAL WET WEIGHT: 122.11 g  
 FINAL WATER CONTENT: 26.5 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	.0622	.9920	6.22
2.0	.50	.1320	.8440	13.20
3.0	1.00	.1799	.7420	17.99
4.0	2.00	.2168	.6640	21.68





Test No. 3



Project: BARNES--McCLUSKY ND

LAB. NUMBER 88C92

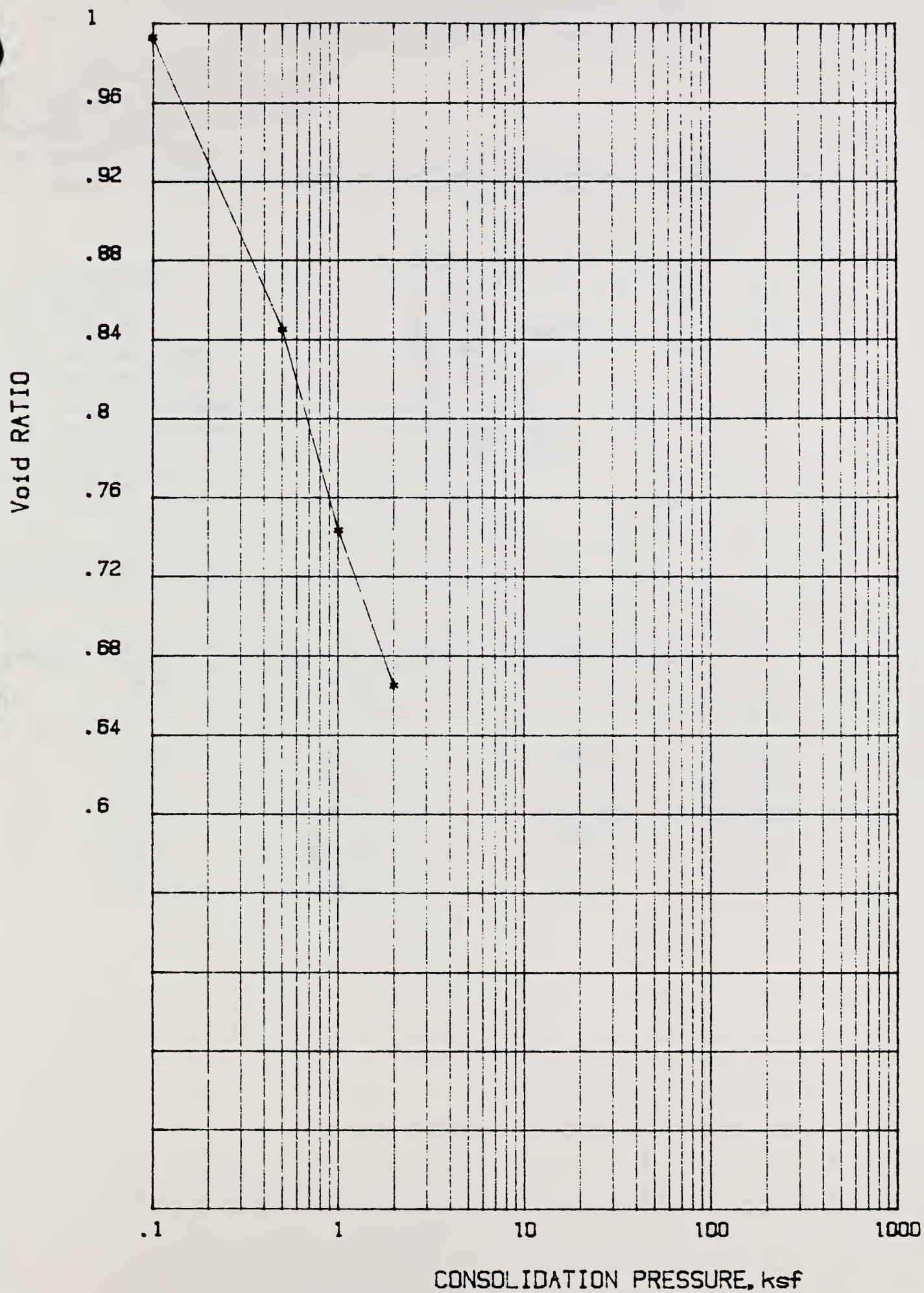
Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.



Test No. 3



Project: BARNES--McCLUSKY ND

LAB. NUMBER 88C92

Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.





# RESULTS OF CONSOLIDATION TEST

=====

Project: WEPP SAMPLE

Field number: HEIDEN-WACO TX.

LAB. NUMBER 88C93

Sample depth: Feet

Sample description: COMPACTED TO .99 GMS/CC CH LL=52 PI=37

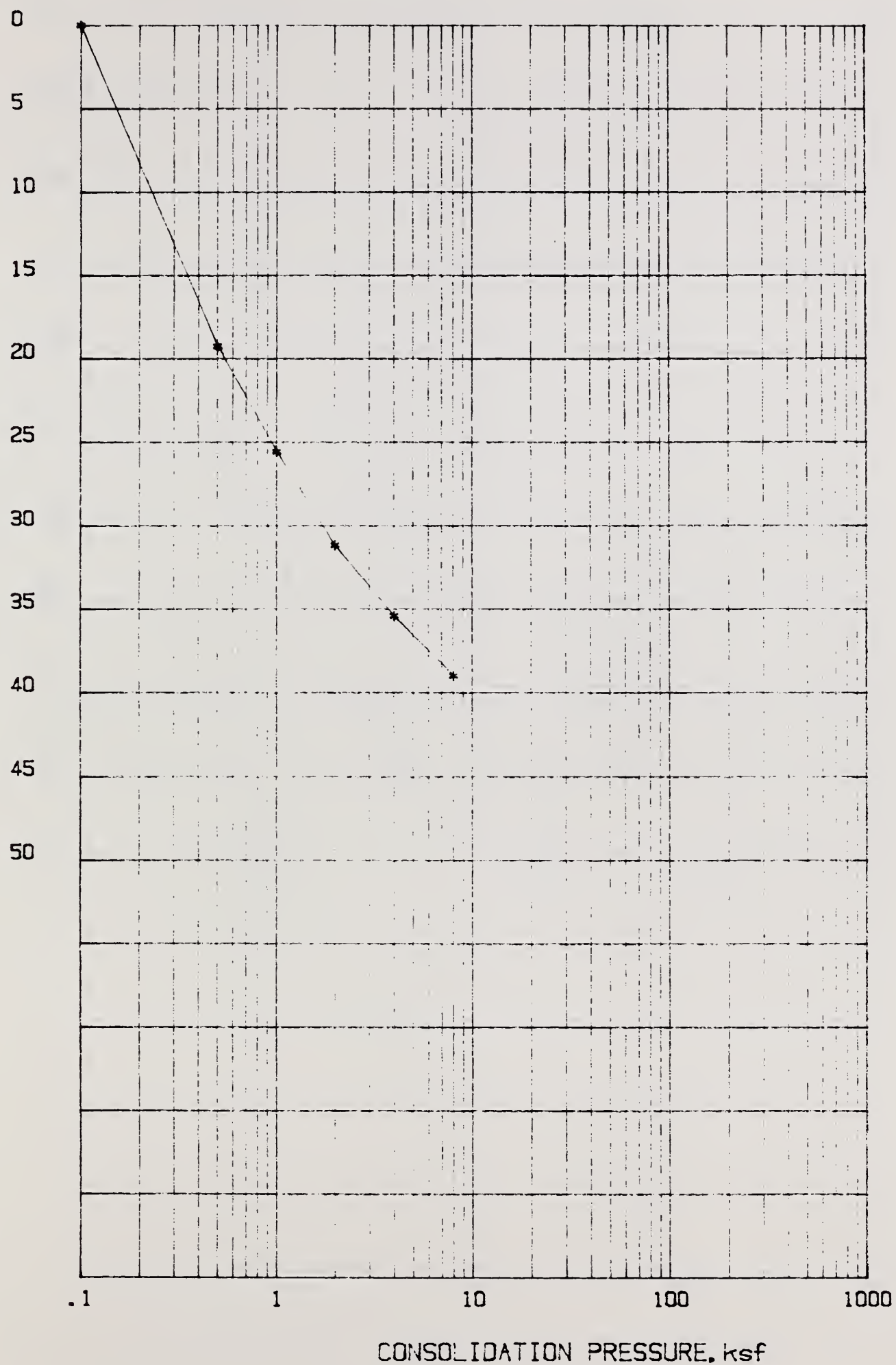
SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 95.78 g  
 INITIAL DRY WEIGHT: 79.73 g  
 INITIAL WATER CONTENT: 20.1 %  
 INITIAL WET DENSITY: 74.335 PCF  
 INITIAL DRY DENSITY: 61.879 PCF  
 SPECIFIC GRAVITY: 2.67  
 INITIAL VOID RATIO: 1.693

FINAL WET WEIGHT: 91.67 g  
 FINAL WATER CONTENT: 14.9 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	0.0000	1.6930	0.00
2.0	.50	.1931	1.1730	19.31
3.0	1.00	.2561	1.0030	25.61
4.0	2.00	.3123	.8520	31.23
5.0	4.00	.3548	.7380	35.48
6.0	8.00	.3907	.6410	39.07



PERCENT CONSOLIDATION-LAB. SAMPLE,



Project: WEPP SAMPLE

LAB. NUMBER 88C93

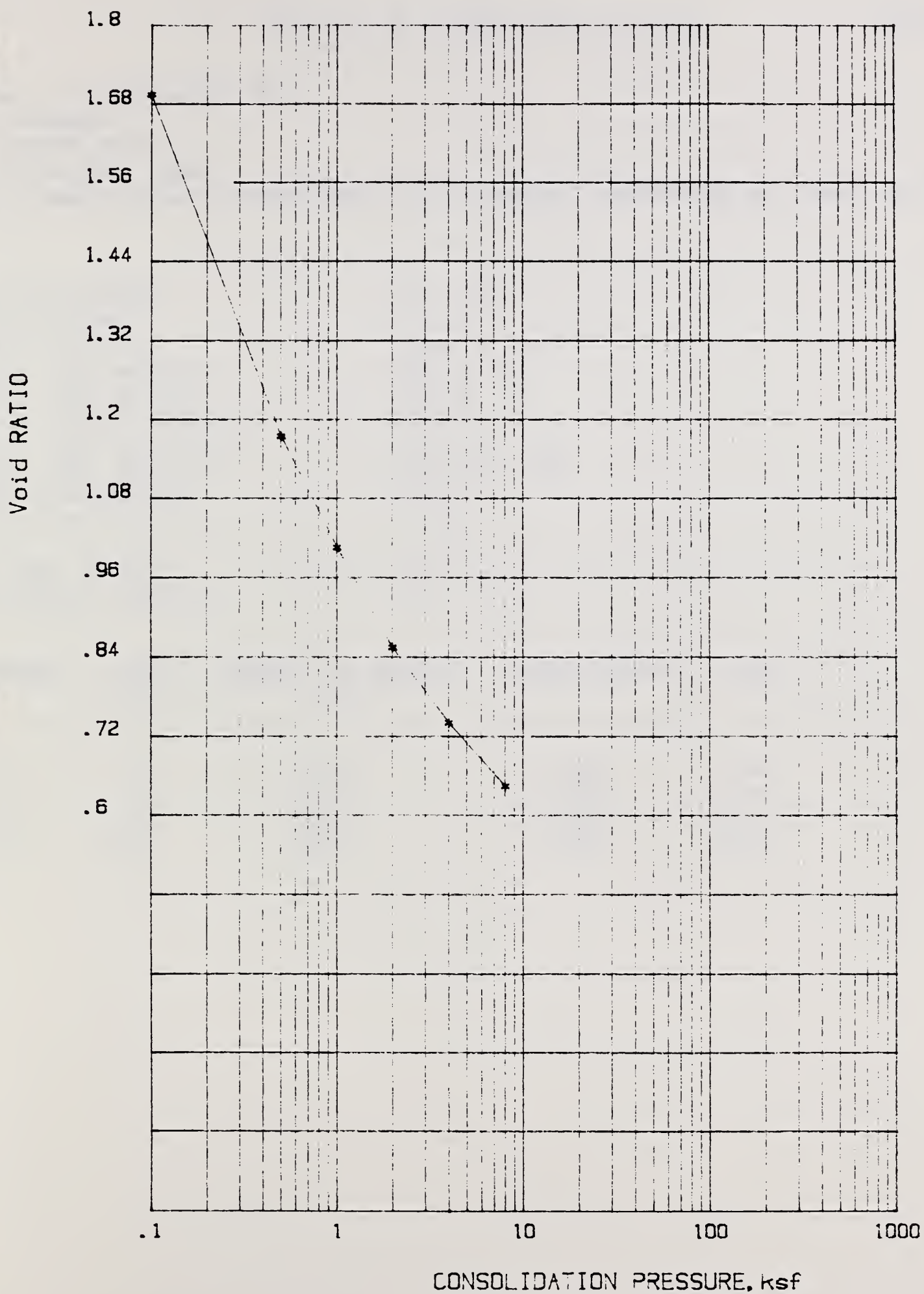
Field number: HEIDEN-WACO TX.

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.







Project: WEPP SAMPLE

LAB. NUMBER 88C93

Field number: HEIDEN-WACO TX.

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



# RESULTS OF CONSOLIDATION TEST

Test #2

Project: HEIDEN-WACO TX.

Field number:

LAB. NUMBER 88C93

Sample depth: Feet

Sample description: COMPACTED TO .99 GMS/CC SATURATED AT START OF TEST

SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 89.98 g  
 INITIAL DRY WEIGHT: 79.62 g  
 INITIAL WATER CONTENT: 13 %  
 INITIAL WET DENSITY: 69.834 PCF  
 INITIAL DRY DENSITY: 61.793 PCF  
 SPECIFIC GRAVITY: 2.67  
 INITIAL VOID RATIO: 1.697

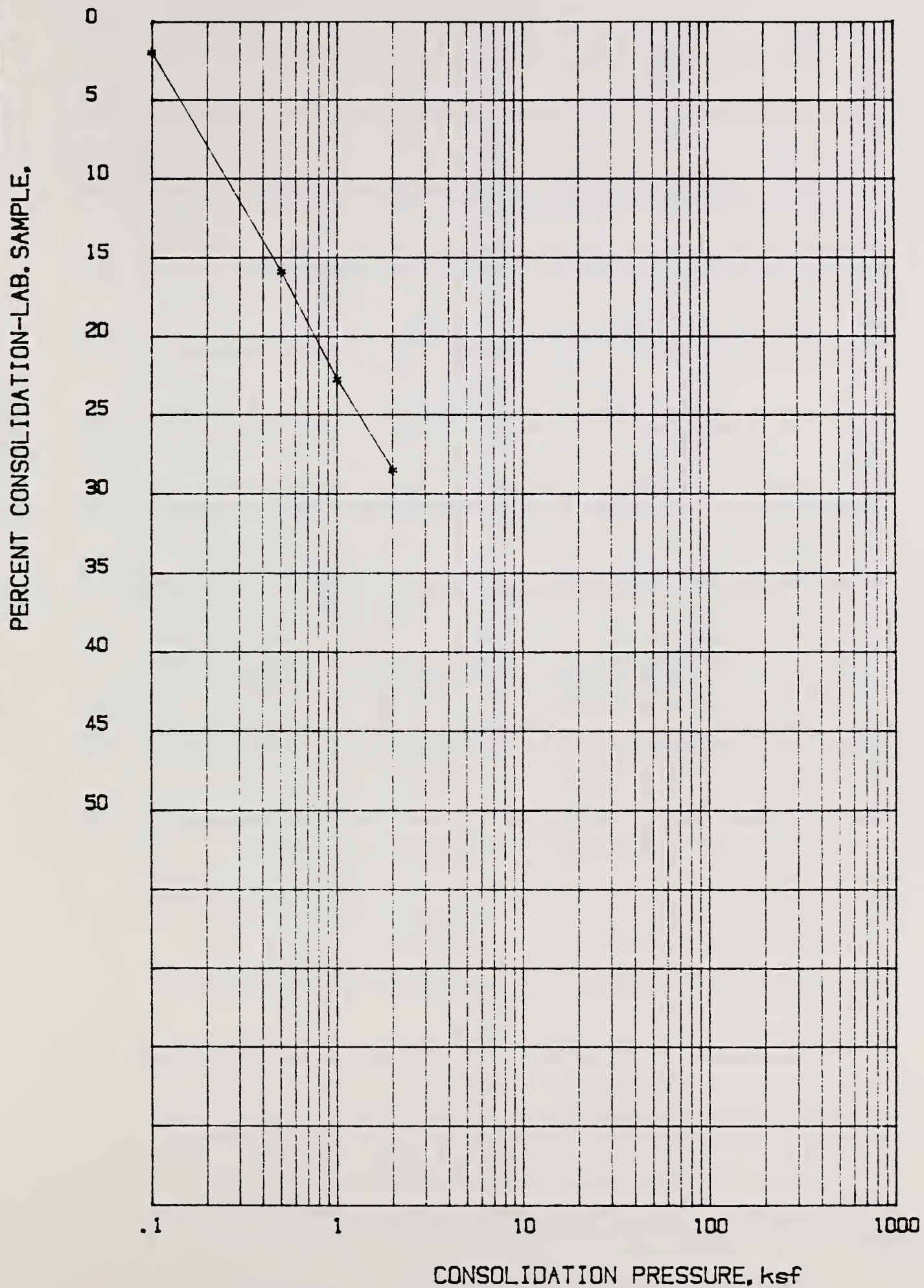
FINAL WET WEIGHT: 104.36 g  
 FINAL WATER CONTENT: 31 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	.0196	1.6440	1.96
2.0	.50	.1592	1.2680	15.92
3.0	1.00	.2279	1.0820	22.79
4.0	2.00	.2854	.9270	28.54





Test 2



Project: HEIDEN-WACO TX.

LAB. NUMBER 88C93

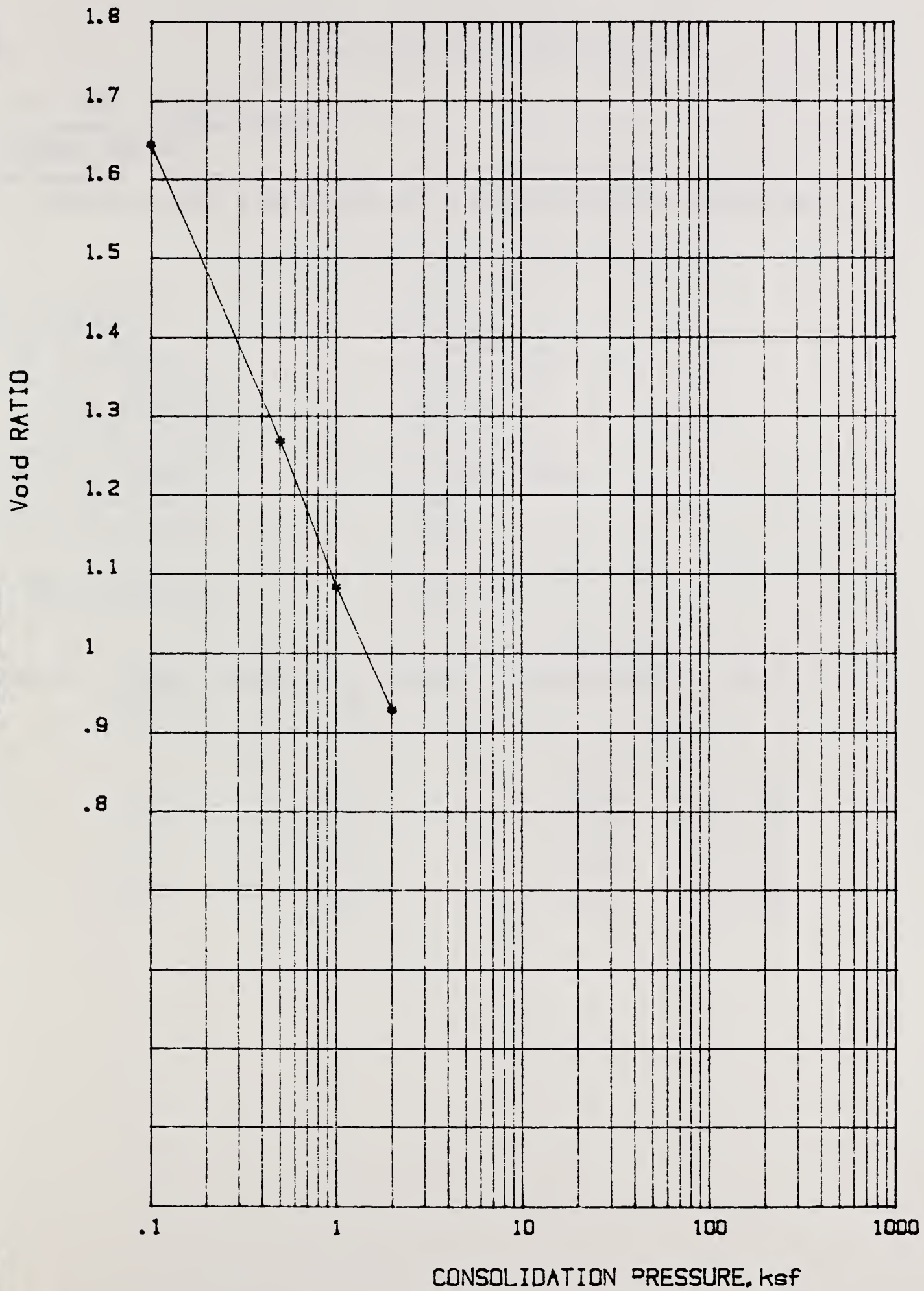
Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.



Test 3



Project: HEIDEN-WACO TX.

LAB. NUMBER 88C93

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





# RESULTS OF CONSOLIDATION TEST

=====

Project: WEPP SAMPLE

Field number: HIRSH-ORD NE.

LAB. NUMBER 88C94

Sample depth: Feet

Sample description: COMPACTED TO 1.43 GM/CC NON-PLASTIC SM

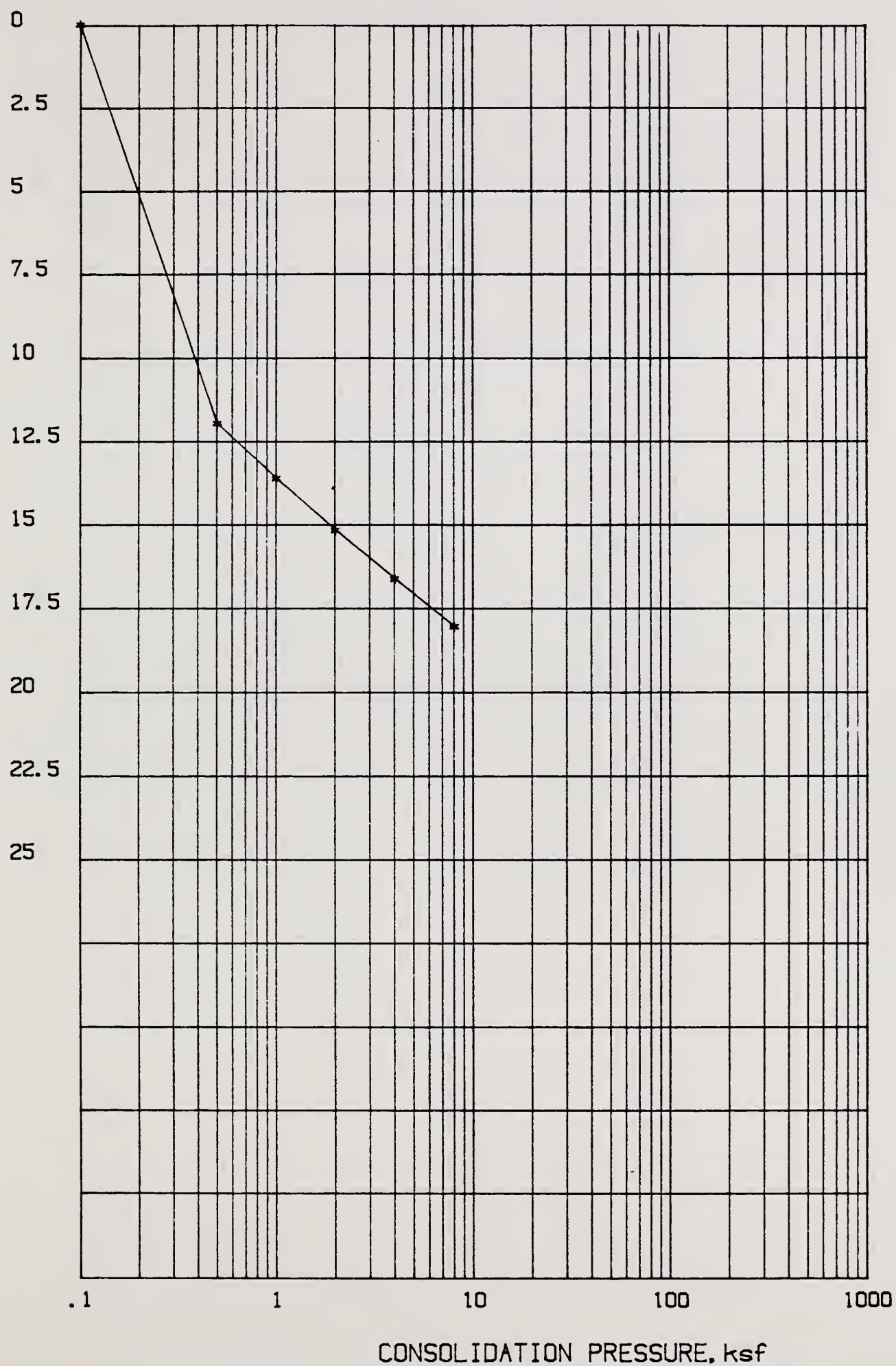
SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 118.08 g  
 INITIAL DRY WEIGHT: 111.69 g  
 INITIAL WATER CONTENT: 5.7 %  
 INITIAL WET DENSITY: 91.642 PCF  
 INITIAL DRY DENSITY: 86.683 PCF  
 SPECIFIC GRAVITY: 2.63  
 INITIAL VOID RATIO: .894

FINAL WET WEIGHT: 132.44 g  
 FINAL WATER CONTENT: 18.5 %

STRESS INCREMENT	LOAD (ksf)	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	0.0000	.8940	0.00
2.0	.50	.1198	.6670	11.98
3.0	1.00	.1363	.6350	13.63
4.0	2.00	.1519	.6060	15.19
5.0	4.00	.1665	.5780	16.65
6.0	8.00	.1808	.5510	18.08



PERCENT CONSOLIDATION-LAB. SAMPLE,



Project: WEPP SAMPLE

LAB. NUMBER 88C94

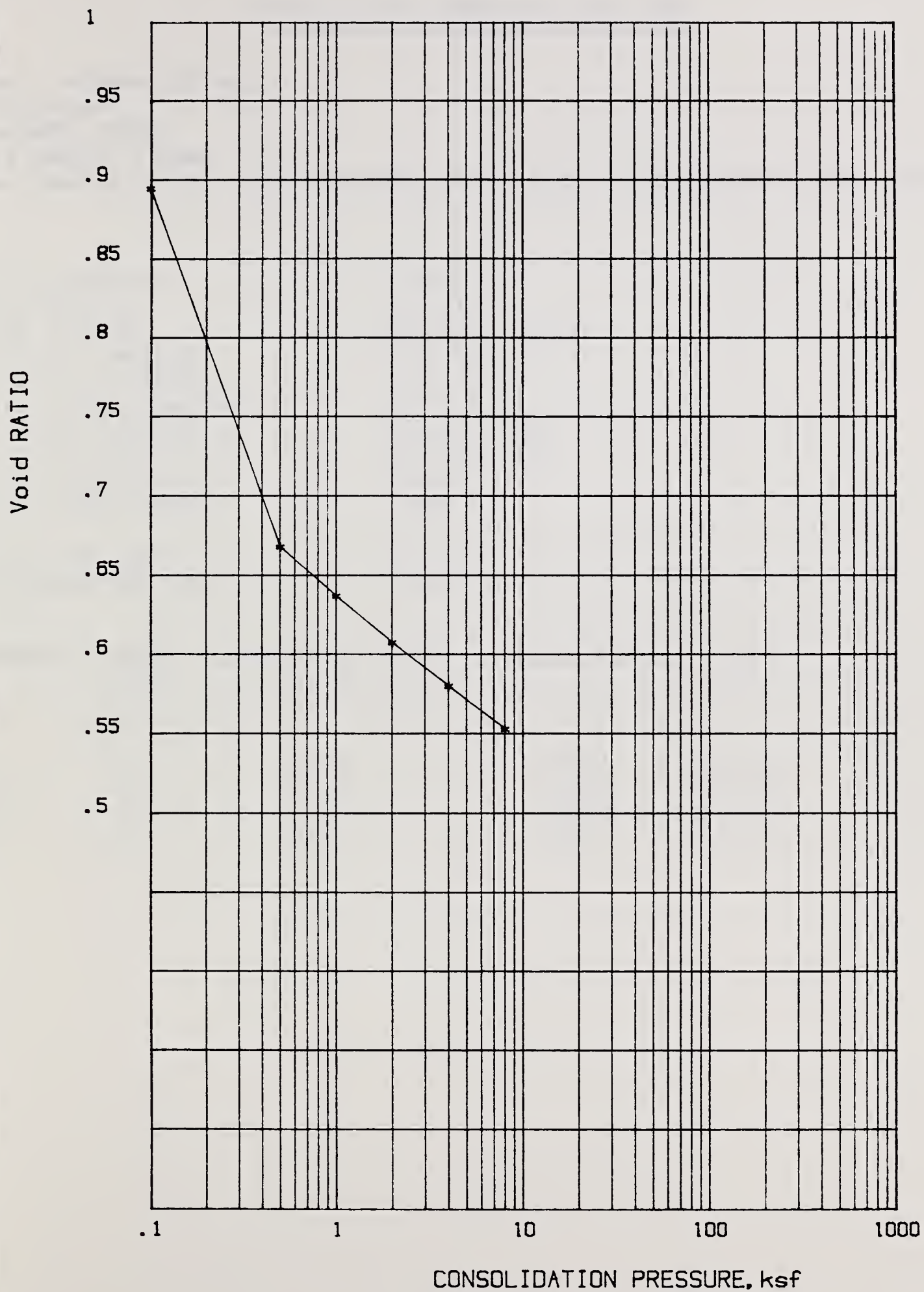
Field number: HIRSH-ORD NE.

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.







Project: WEPP SAMPLE

LAB. NUMBER 88C94

Field number: HIRSH-ORD NE.

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



Test #2

RESULTS OF CONSOLIDATION TEST  
=====

Project: HIRSH-ORD NE  
Field number:  
LAB.NUMBER 88C94  
Sample depth: Feet  
Sample description: COMPACTED TO 1.39 GMS/CC SATURATED AT START OF TEST

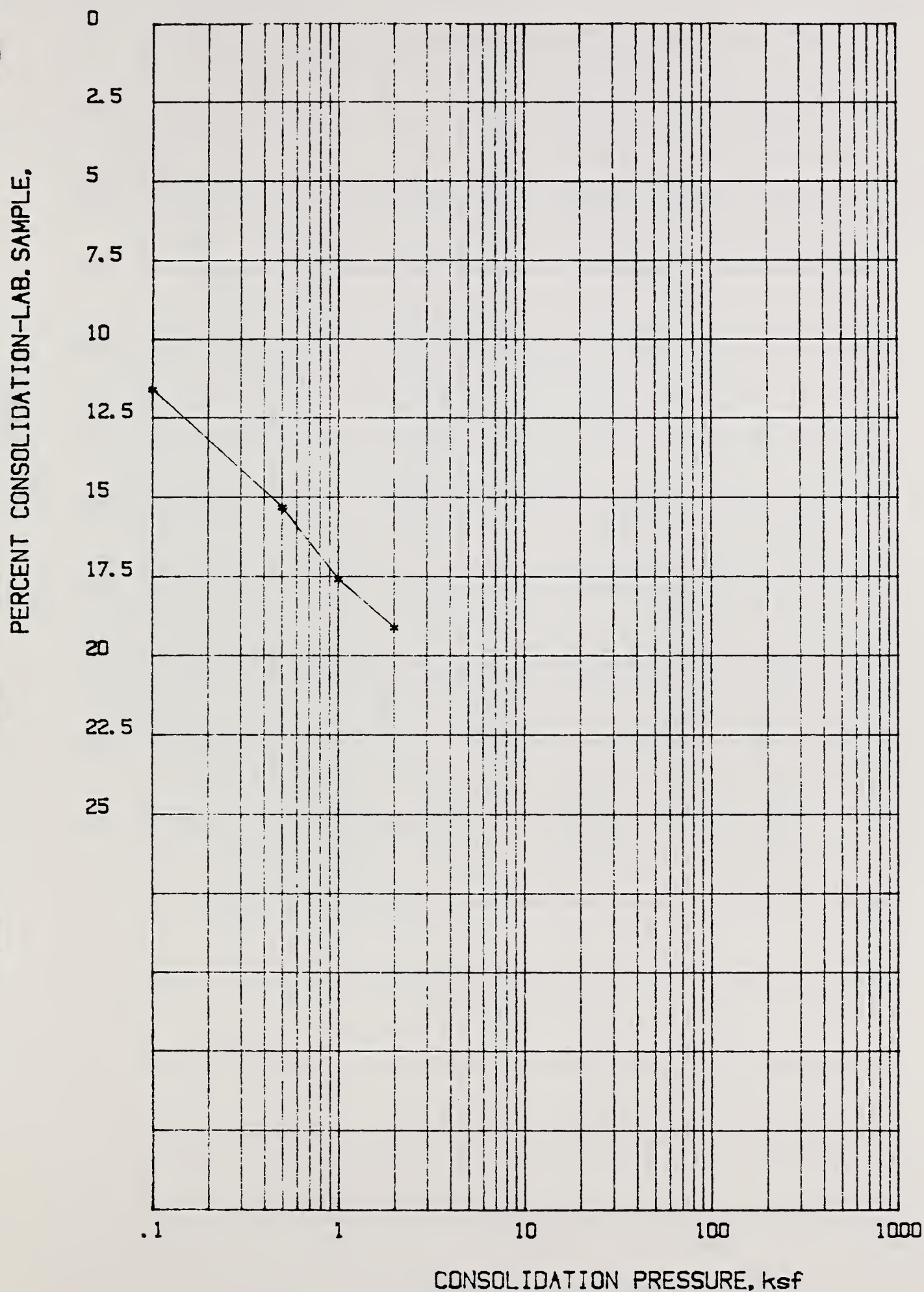
SAMPLE DIAMETER: 2.5 ins  
SAMPLE HEIGHT: 1 ins  
INITIAL VOLUME: 80.439 cm<sup>3</sup>  
INITIAL WET WEIGHT: 117.6 g  
INITIAL DRY WEIGHT: 111.8 g  
INITIAL WATER CONTENT: 5.1 %  
INITIAL WET DENSITY: 91.27 PCF  
INITIAL DRY DENSITY: 86.768 PCF  
SPECIFIC GRAVITY: 2.63  
INITIAL VOID RATIO: .892  
  
FINAL WET WEIGHT: 132.61 g  
FINAL WATER CONTENT: 18.6 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	.1163	.6720	11.63
2.0	.50	.1536	.6010	15.36
3.0	1.00	.1763	.5580	17.63
4.0	2.00	.1916	.5290	19.16





Test No. 2



Project: HIRSH-ORD NE

LAB. NUMBER 88C94

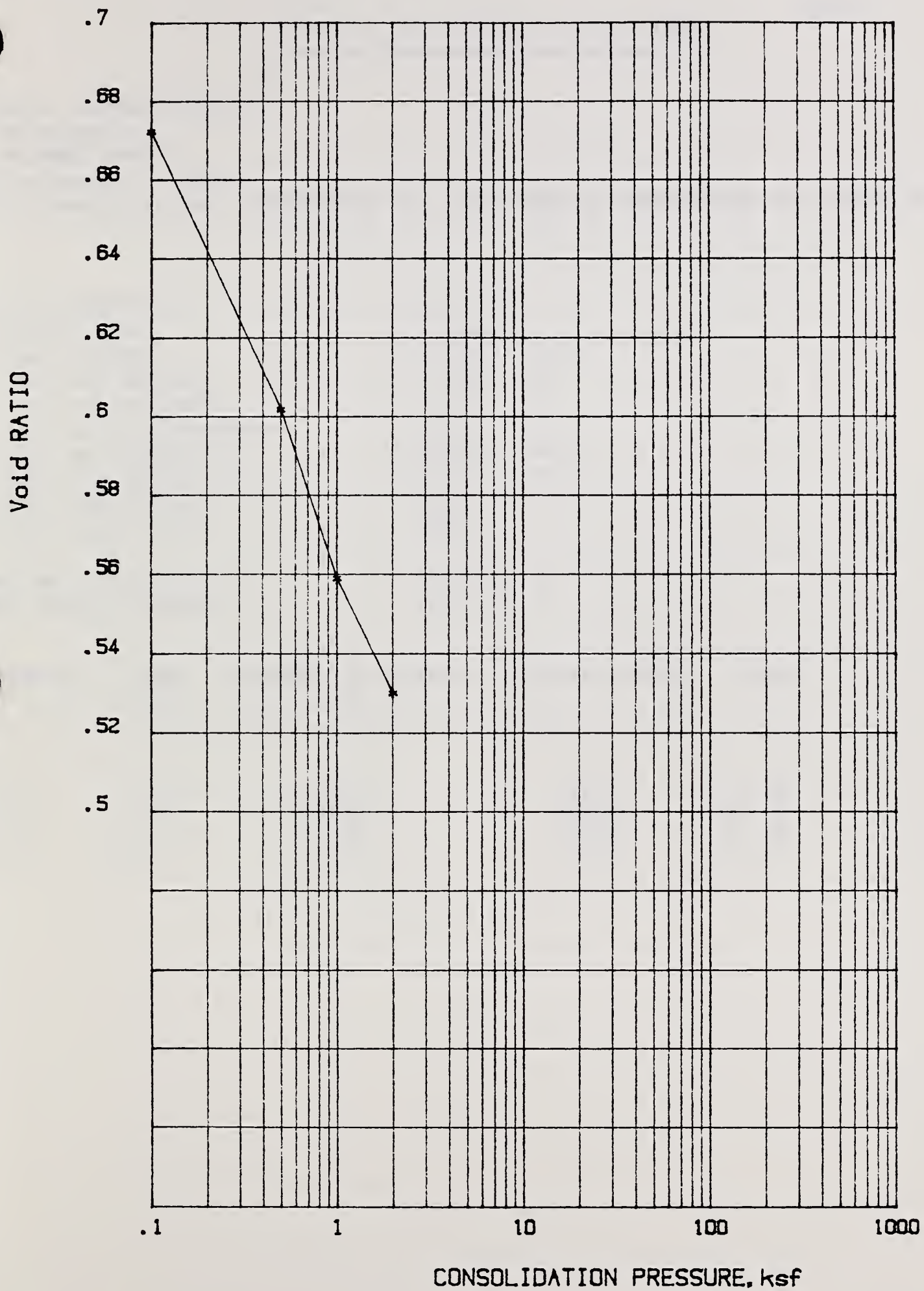
Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.



Test No. 2



Project: HIRSH-ORD NE

LAB. NUMBER 88C94

Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.





Test #3

RESULTS OF CONSOLIDATION TEST  
=====

Project: HIRSH-ORD NE.  
Field number:  
LAB.NUMBER 88C94  
Sample depth: Feet  
Sample description: COMPACTED TO 1.39 GMS/CC SATURATED AT START OF TEST

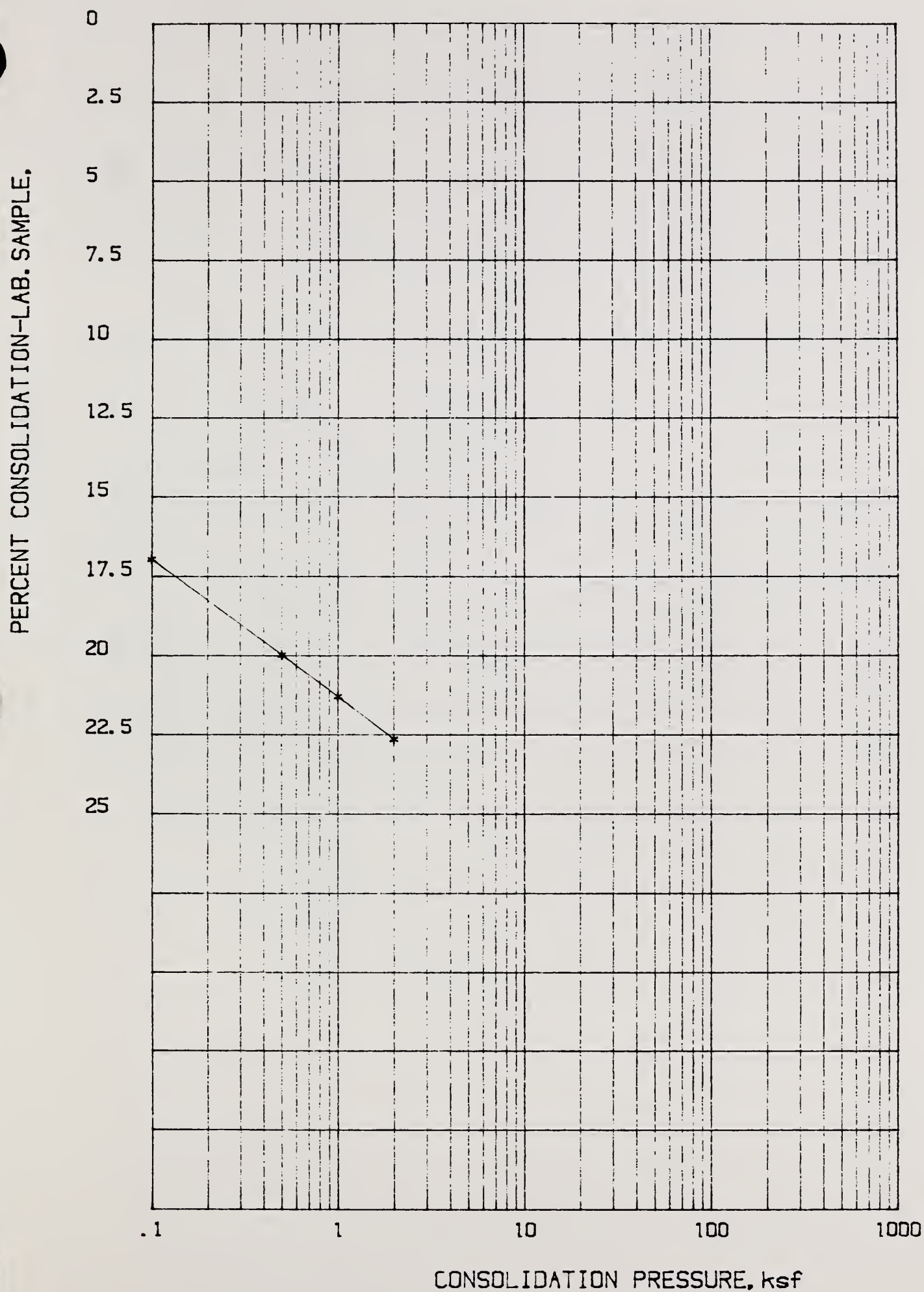
SAMPLE DIAMETER: 2.5 ins  
SAMPLE HEIGHT: 1 ins  
INITIAL VOLUME: 80.439 cm<sup>3</sup>  
INITIAL WET WEIGHT: 115.88 g  
INITIAL DRY WEIGHT: 111.81 g  
INITIAL WATER CONTENT: 3.6 %  
INITIAL WET DENSITY: 89.935 PCF  
INITIAL DRY DENSITY: 86.776 PCF  
SPECIFIC GRAVITY: 2.63  
INITIAL VOID RATIO: .892

FINAL WET WEIGHT: 135.16 g  
FINAL WATER CONTENT: 20.8 %

STRESS INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	.1700	.5700	17.00
2.0	.50	.2003	.5130	20.03
3.0	1.00	.2135	.4880	21.35
4.0	2.00	.2270	.4620	22.70



Test No. 3



Project: HIRSH-ORD NE.

LAB. NUMBER 88C94

Field number:

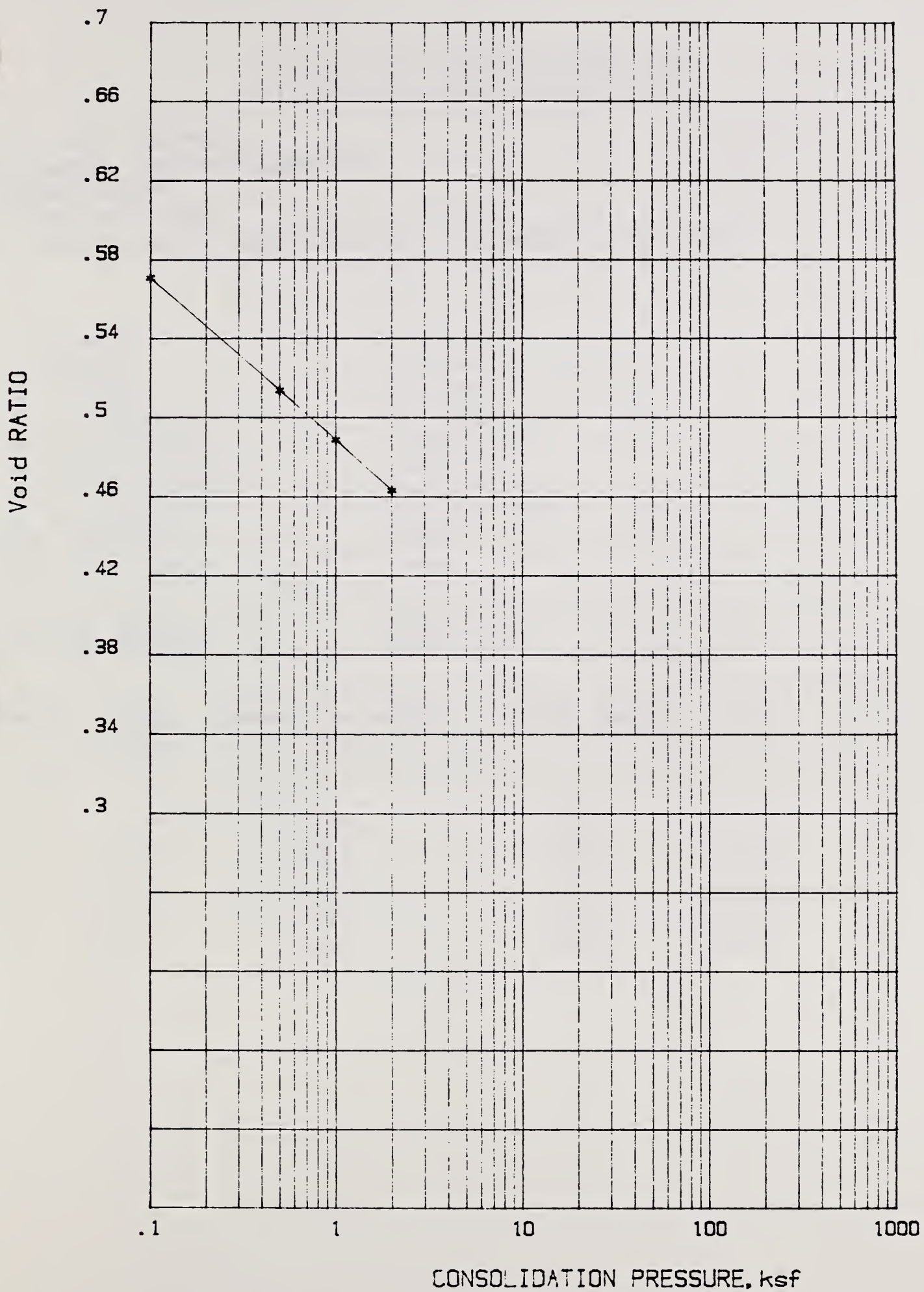
Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





Test No. 3



Project: HIRSH-ORD NE.

LAB. NUMBER 88C94

Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.



RESULTS OF CONSOLIDATION TEST  
=====

Project: WEPP SAMPLE  
Field number: KEITH-ALBION WY.  
LAB. NUMBER 88C95  
Sample depth: Feet  
Sample description: COMPACTED TO 1.32 GM/CC LL=32 PI=13

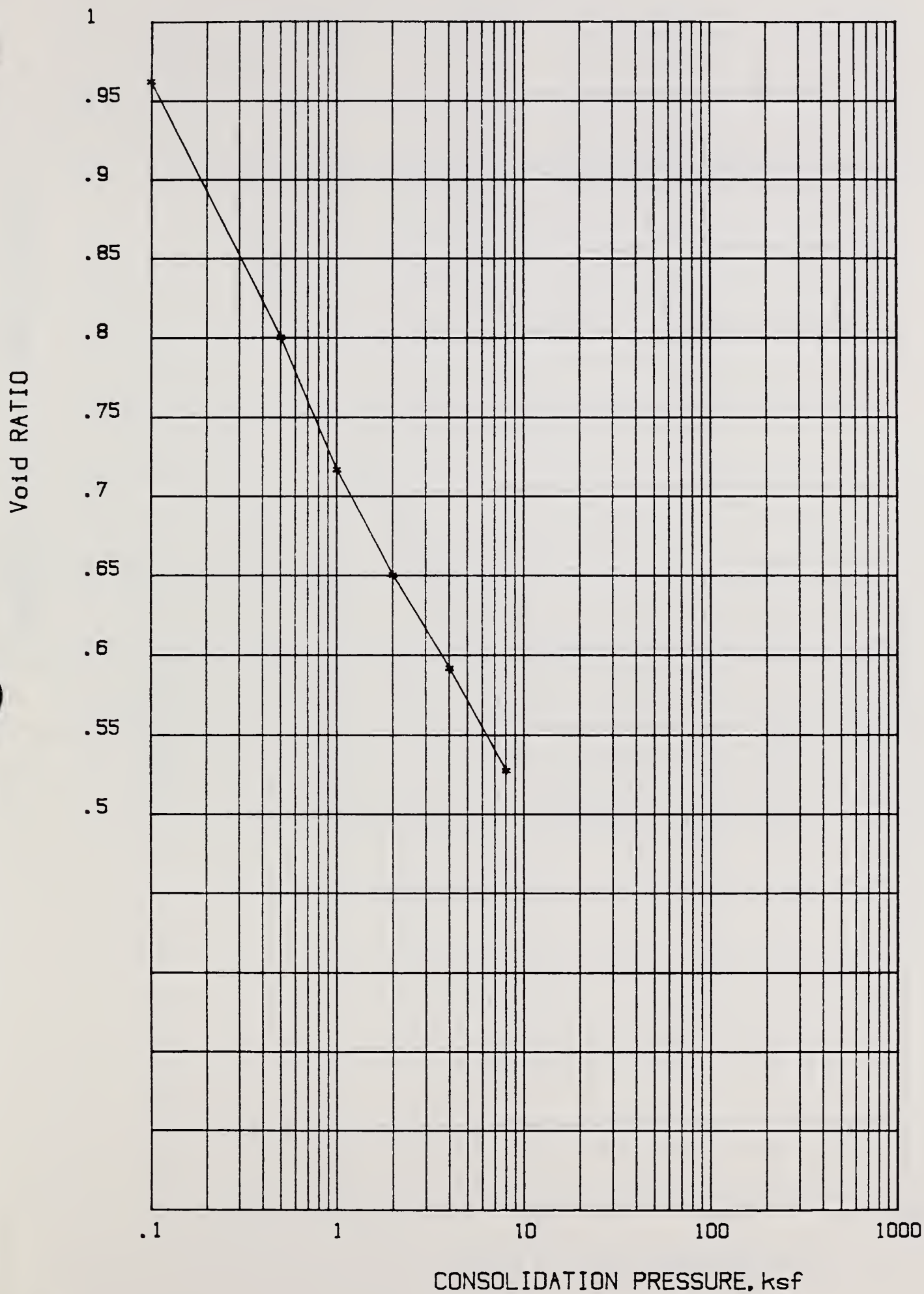
SAMPLE DIAMETER: 2.5 ins  
SAMPLE HEIGHT: 1 ins  
INITIAL VOLUME: 80.439 cm<sup>3</sup>  
INITIAL WET WEIGHT: 121.43 g  
INITIAL DRY WEIGHT: 106.18 g  
INITIAL WATER CONTENT: 14.3 %  
INITIAL WET DENSITY: 94.242 PCF  
INITIAL DRY DENSITY: 82.407 PCF  
SPECIFIC GRAVITY: 2.59  
INITIAL VOID RATIO: .962

FINAL WET WEIGHT: 128.11 g  
FINAL WATER CONTENT: 20.6 %

LOAD INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	0.0000	.9620	0.00
2.0	.50	.0827	.7990	8.27
3.0	1.00	.1253	.7160	12.53
4.0	2.00	.1593	.6490	15.93
5.0	4.00	.1891	.5910	18.91
6.0	8.00	.2220	.5260	22.20







Project: WEPP SAMPLE

LAB. NUMBER 88C95

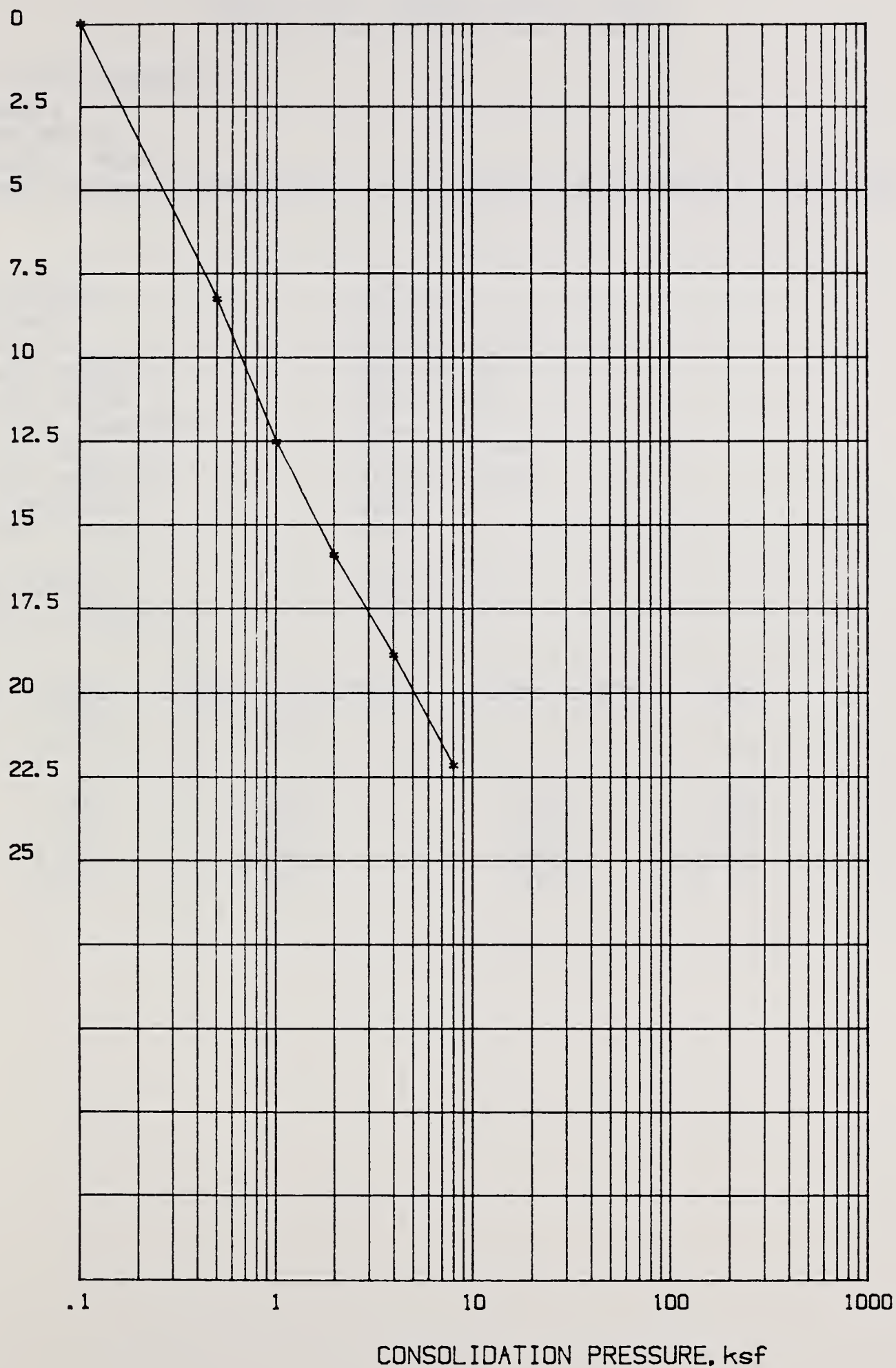
Field number: KEITH-ALBION WY.

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



PERCENT CONSOLIDATION-LAB. SAMPLE.



Project: WEPP SAMPLE

LAB. NUMBER 88C95

Field number: KEITH-ALBION WY.

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





Test 2

RESULTS OF CONSOLIDATION TEST

=====

Project: KIETH-ALBIN WY

Field number:

LAB.NUMBER 88C95

Sample depth: Feet

Sample description: COMPACTED TO 1.32 GMS/CC SATURATED AT START OF TEST

SAMPLE DIAMETER: 2.5 ins  
SAMPLE HEIGHT: 1 ins  
INITIAL VOLUME: 80.439 cm<sup>3</sup>  
INITIAL WET WEIGHT: 125.78 g  
INITIAL DRY WEIGHT: 106.17 g  
INITIAL WATER CONTENT: 18.4 %  
INITIAL WET DENSITY: 97.618 PCF  
INITIAL DRY DENSITY: 82.399 PCF  
SPECIFIC GRAVITY: 2.59  
INITIAL VOID RATIO: .962

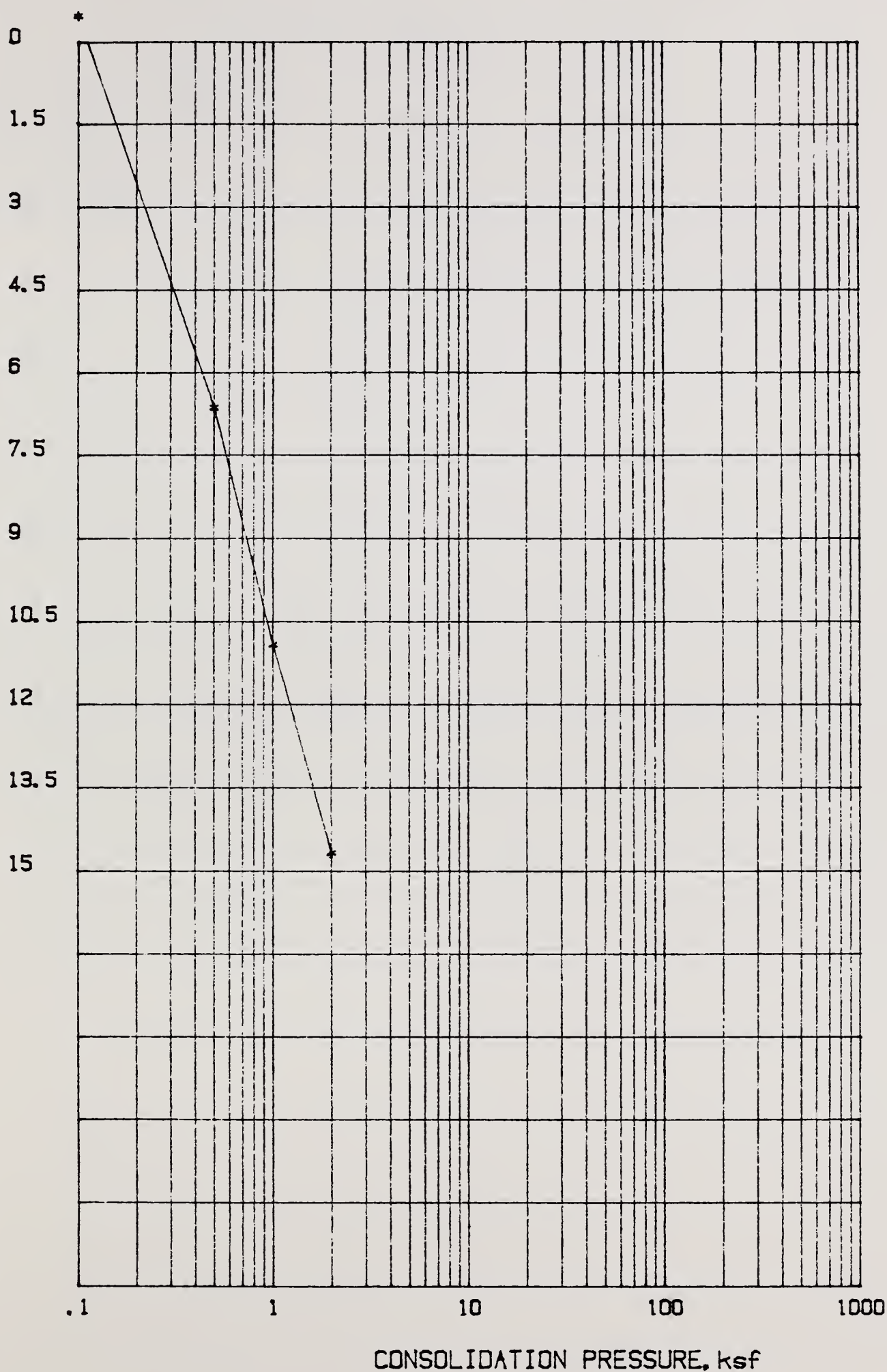
FINAL WET WEIGHT: 135.88 g  
FINAL WATER CONTENT: 27.9 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	-.0048	.9710	-.48
2.0	.50	.0665	.8310	6.65
3.0	1.00	.1094	.7470	10.94
4.0	2.00	.1470	.6730	14.70



Test 2

PERCENT CONSOLIDATION-LAB. SAMPLE,



Project: KIETH-ALBIN WY

LAB. NUMBER 88C95

Field number:

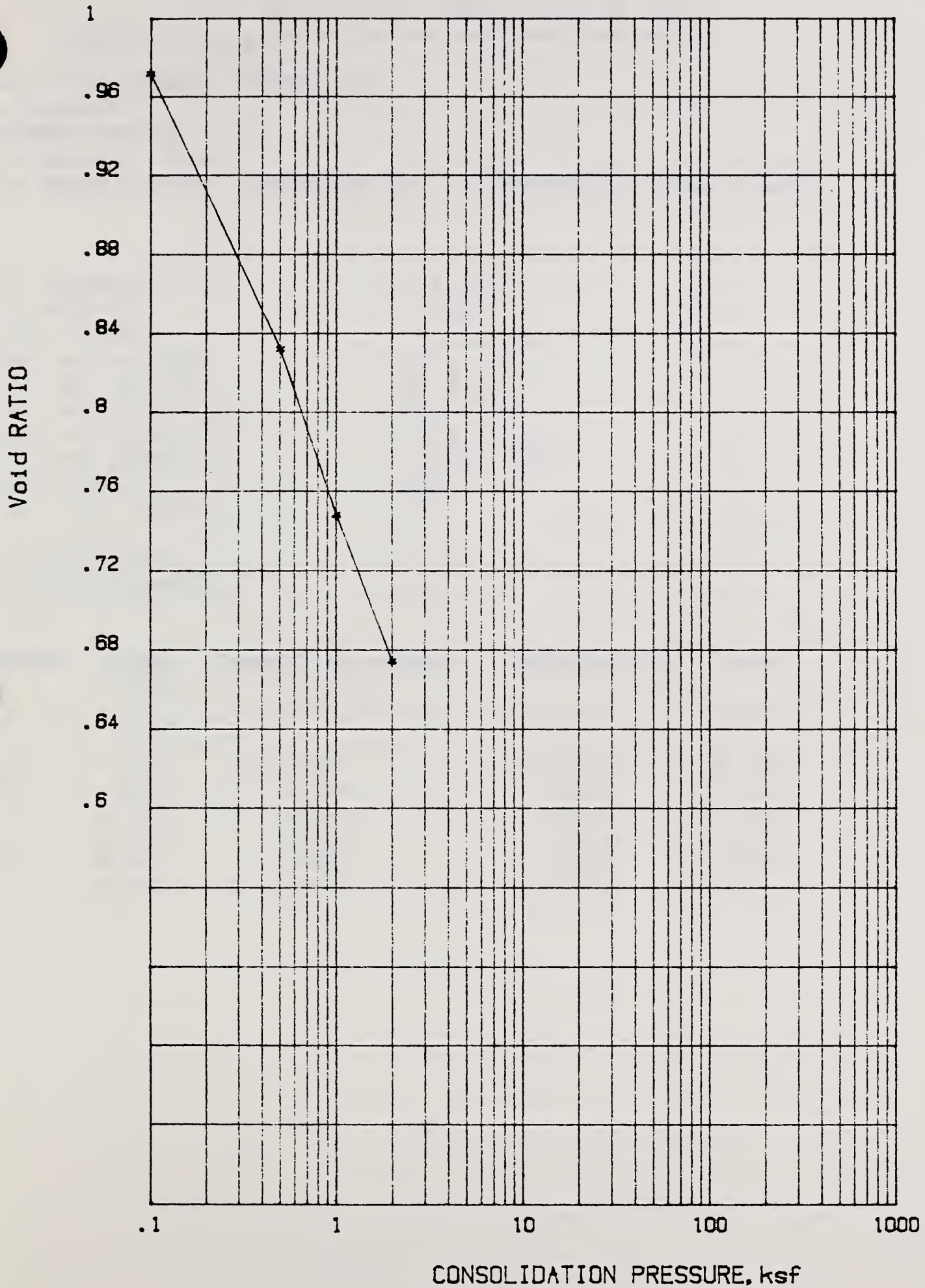
Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.





Test 2



Project: KIETH-ALBIN WY

LAB. NUMBER 88C95

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



# RESULTS OF CONSOLIDATION TEST

*WEPP Sample*

Project: LOS BANOS--FRESNO CA.

Field number:

LAB.NUMBER 88C96

Sample depth: Feet

Sample description: COMPACTED TO 1.0 GMS/CC CL LL=46 PI=25

SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 92.1 g  
 INITIAL DRY WEIGHT: 80.43 g  
 INITIAL WATER CONTENT: 14.5 %  
 INITIAL WET DENSITY: 71.479 PCF  
 INITIAL DRY DENSITY: 62.422 PCF  
 SPECIFIC GRAVITY: 2.61  
 INITIAL VOID RATIO: 1.61

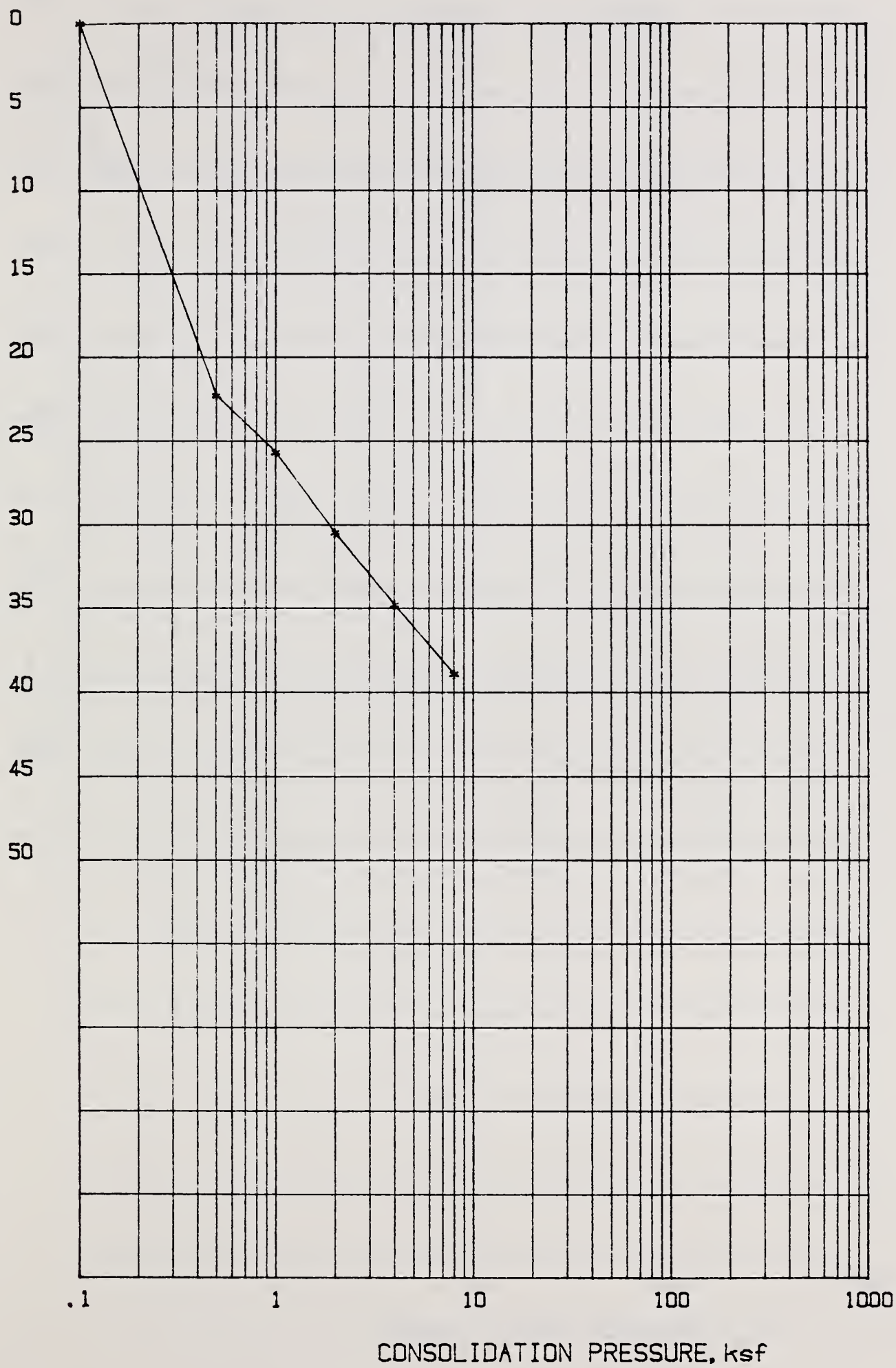
FINAL WET WEIGHT: 102.46 g  
 FINAL WATER CONTENT: 27.3 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	0.0000	1.6100	0.00
2.0	.50	.2234	1.0270	22.34
3.0	1.00	.2571	.9390	25.71
4.0	2.00	.3053	.8130	30.53
5.0	4.00	.3486	.7000	34.86
6.0	8.00	.3900	.5920	39.00





PERCENT CONSOLIDATION-LAB. SAMPLE.



Project: LOS BANOS--FRESNO CA.

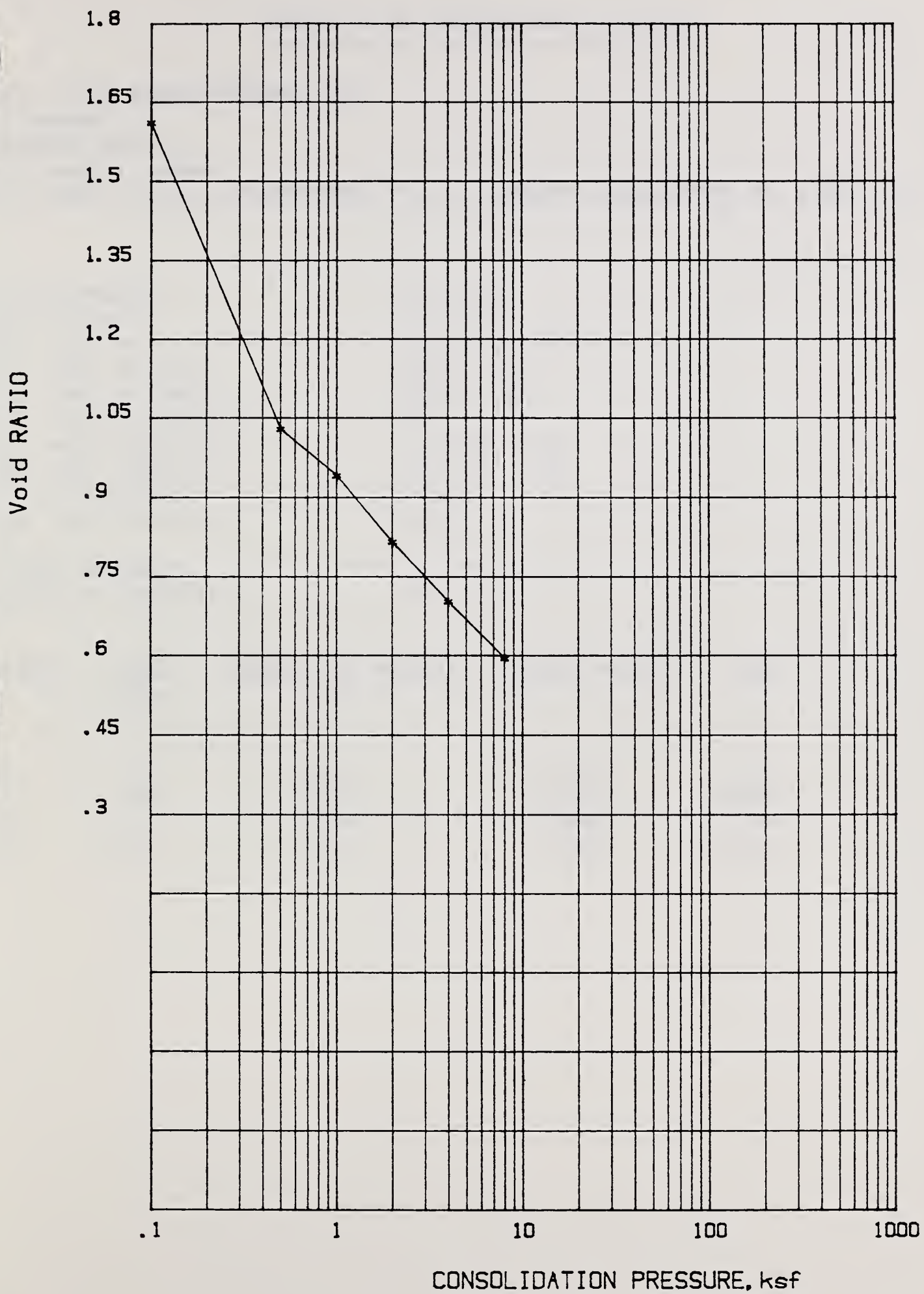
LAB. NUMBER 88C96

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





Project: LOS BANOS--FRESNO CA.

LAB. NUMBER 88C96

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





## RESULTS OF CONSOLIDATION TEST

=====

Project: LOS BANOS-FRESNO CA

Field number:

LAB. NUMBER 88C96

Sample depth: Feet

Sample description: COMPACTED TO 1.0 GMS/CC SATURATED AT START OF TEST

SAMPLE DIAMETER: 2.5 ins  
SAMPLE HEIGHT: 1 ins  
INITIAL VOLUME: 80.439 cm<sup>3</sup>  
INITIAL WET WEIGHT: 92.57 g  
INITIAL DRY WEIGHT: 80.43 g  
INITIAL WATER CONTENT: 15 %  
INITIAL WET DENSITY: 71.844 PCF  
INITIAL DRY DENSITY: 62.422 PCF  
SPECIFIC GRAVITY: 2.61  
INITIAL VOID RATIO: 1.61

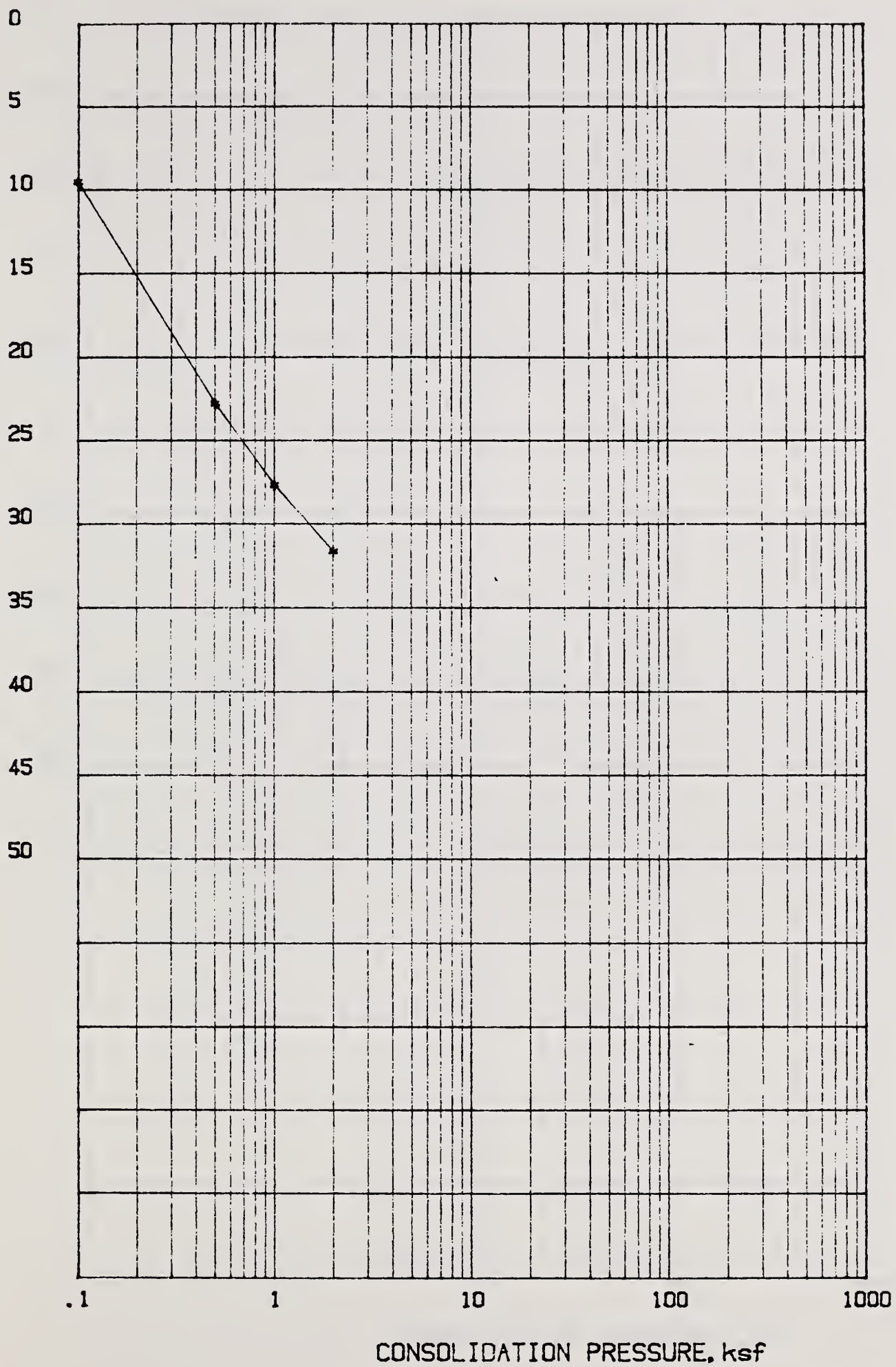
FINAL WET WEIGHT: 106.24 g  
FINAL WATER CONTENT: 32 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	.0953	1.3610	9.53
2.0	.50	.2282	1.0140	22.82
3.0	1.00	.2774	.8860	27.74
4.0	2.00	.3172	.7820	31.72



Test 2

PERCENT CONSOLIDATION-LAB. SAMPLE.



Project: LOS BANOS-FRESNO CA

LAB. NUMBER 88C96

Field number:

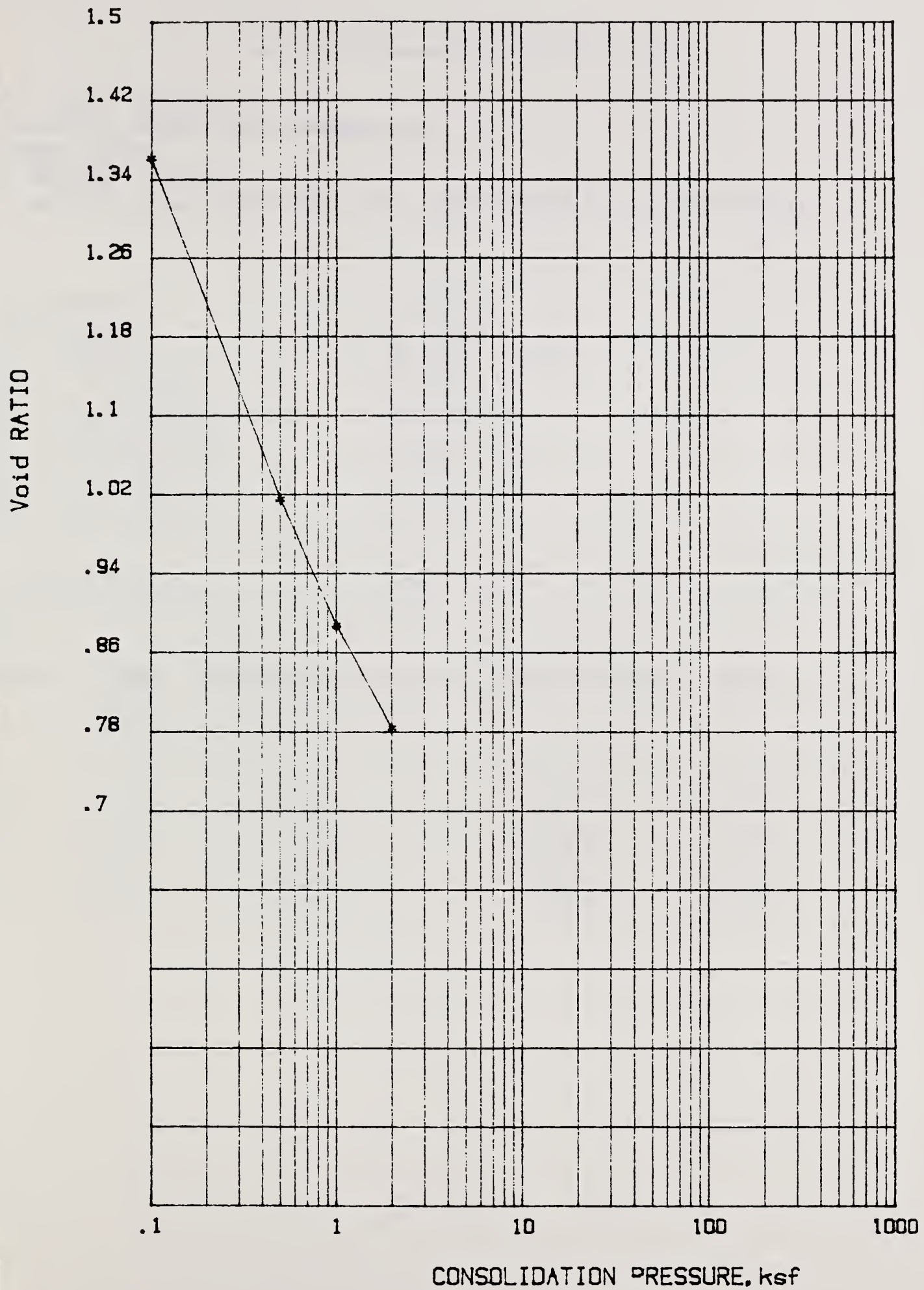
Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





Test 2



Project: LOS BANOS-FRESNO CA

LAB. NUMBER 88C96

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



# RESULTS OF CONSOLIDATION TEST

=====

Project: WEPP SAMPLE  
 Field number: PIERE-COTTONWOOD SD.  
 LAB.NUMBER 88C97  
 Sample depth: - Feet  
 Sample description: REMOLDED TO 1.05 GMS/CC CH LL=52 PI=32

SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 98.35 g  
 INITIAL DRY WEIGHT: 84.46 g  
 INITIAL WATER CONTENT: 16.4 %  
 INITIAL WET DENSITY: 76.33 PCF  
 INITIAL DRY DENSITY: 65.55 PCF  
 SPECIFIC GRAVITY: 2.71  
 INITIAL VOID RATIO: 1.581

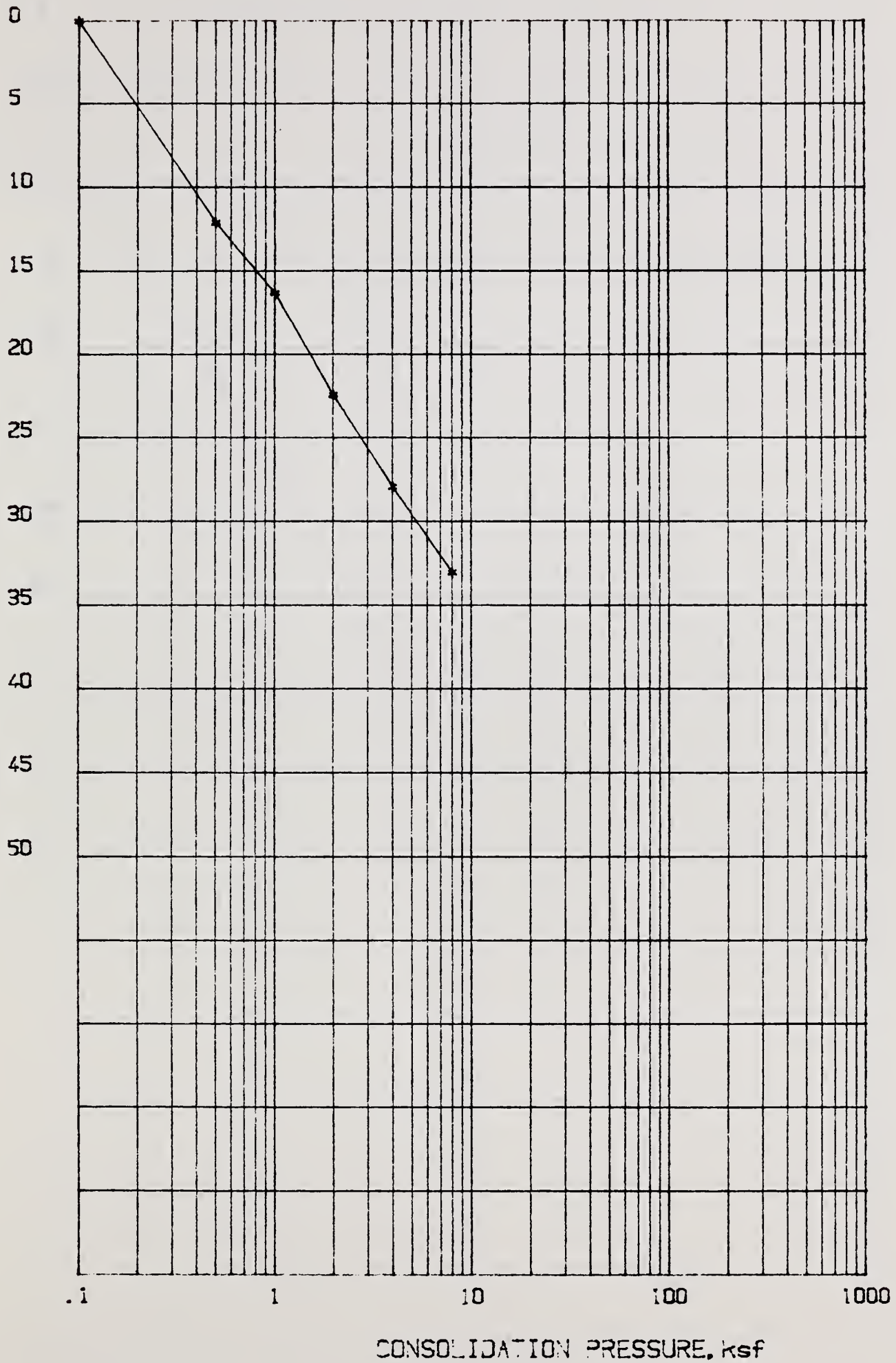
FINAL WET WEIGHT: 108.92 g  
 FINAL WATER CONTENT: 28.9 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	0.0000	1.5810	0.00
2.0	.50	.1214	1.2670	12.14
3.0	1.00	.1638	1.1580	16.38
4.0	2.00	.2251	1.0000	22.51
5.0	4.00	.2802	.8570	28.02
6.0	8.00	.3313	.7250	33.13





PERCENT CONSOLIDATION-LAB. SAMPLE.



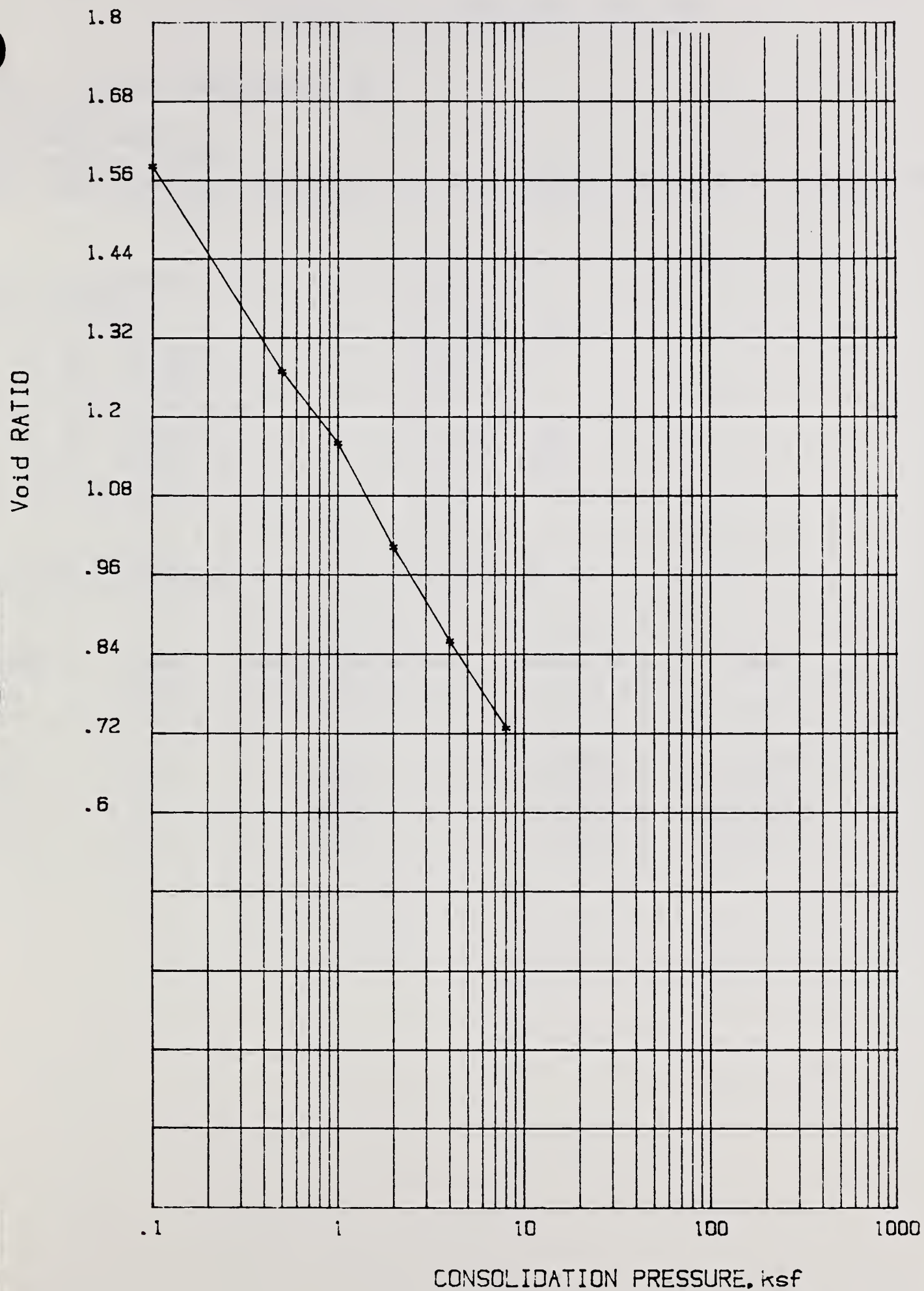
Project: WEPP SAMPLE

LAB. NUMBER 88C97

Field number: PIERE-COTTONWOOD SJ. Sample depth: - Feet

USDA-SCS S.M.L. LINCOLN NE.





Project: WEPP SAMPLE                      LAB. NUMBER 88C97  
Field number: PIERE-COTTONWOOD SD Sample depth: - Feet  
USDA-SCS S. M. L. LINCOLN NE.





Test 2

RESULTS OF CONSOLIDATION TEST

=====

Project: PIERRE-COTTONWOOD SD

Field number:

LAB.NUMBER 88C97

Sample depth: Feet

Sample description: COMPACTED TO 1.05 GMS/CC SATURATED AT START OF TEST

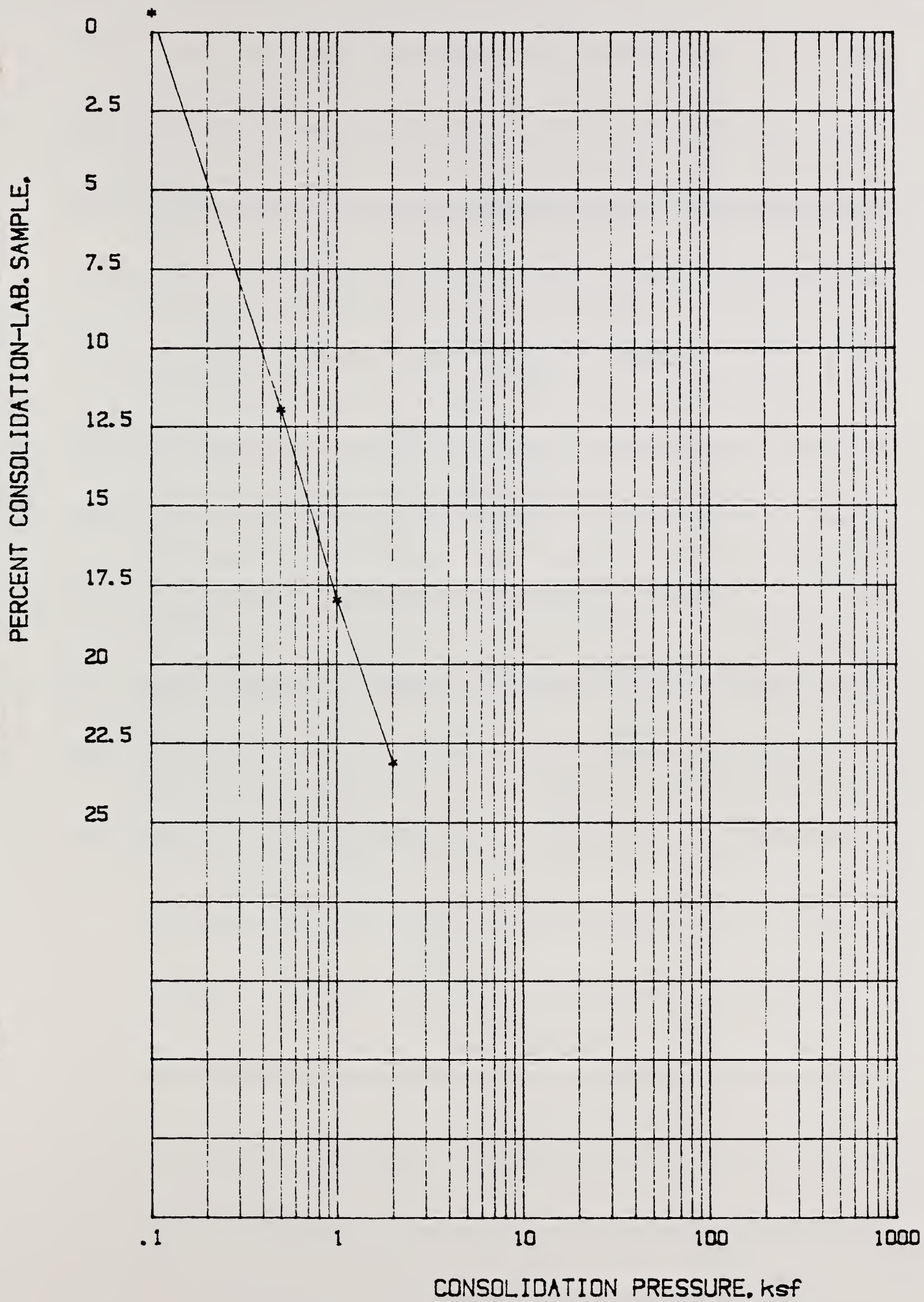
SAMPLE DIAMETER: 2.5 ins  
SAMPLE HEIGHT: 1 ins  
INITIAL VOLUME: 80.439 cm<sup>3</sup>  
INITIAL WET WEIGHT: 100.7 g  
INITIAL DRY WEIGHT: 84.45 g  
INITIAL WATER CONTENT: 19.2 %  
INITIAL WET DENSITY: 78.154 PCF  
INITIAL DRY DENSITY: 65.542 PCF  
SPECIFIC GRAVITY: 2.71  
INITIAL VOID RATIO: 1.581

FINAL WET WEIGHT: 113.08 g  
FINAL WATER CONTENT: 33.9 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	-.0064	1.5970	-.64
2.0	.50	.1198	1.2720	11.98
3.0	1.00	.1799	1.1160	17.99
4.0	2.00	.2315	.9830	23.15



Test 2



Project: PIERRE-COTTONWOOD SD

LAB. NUMBER 88C97

Field number:

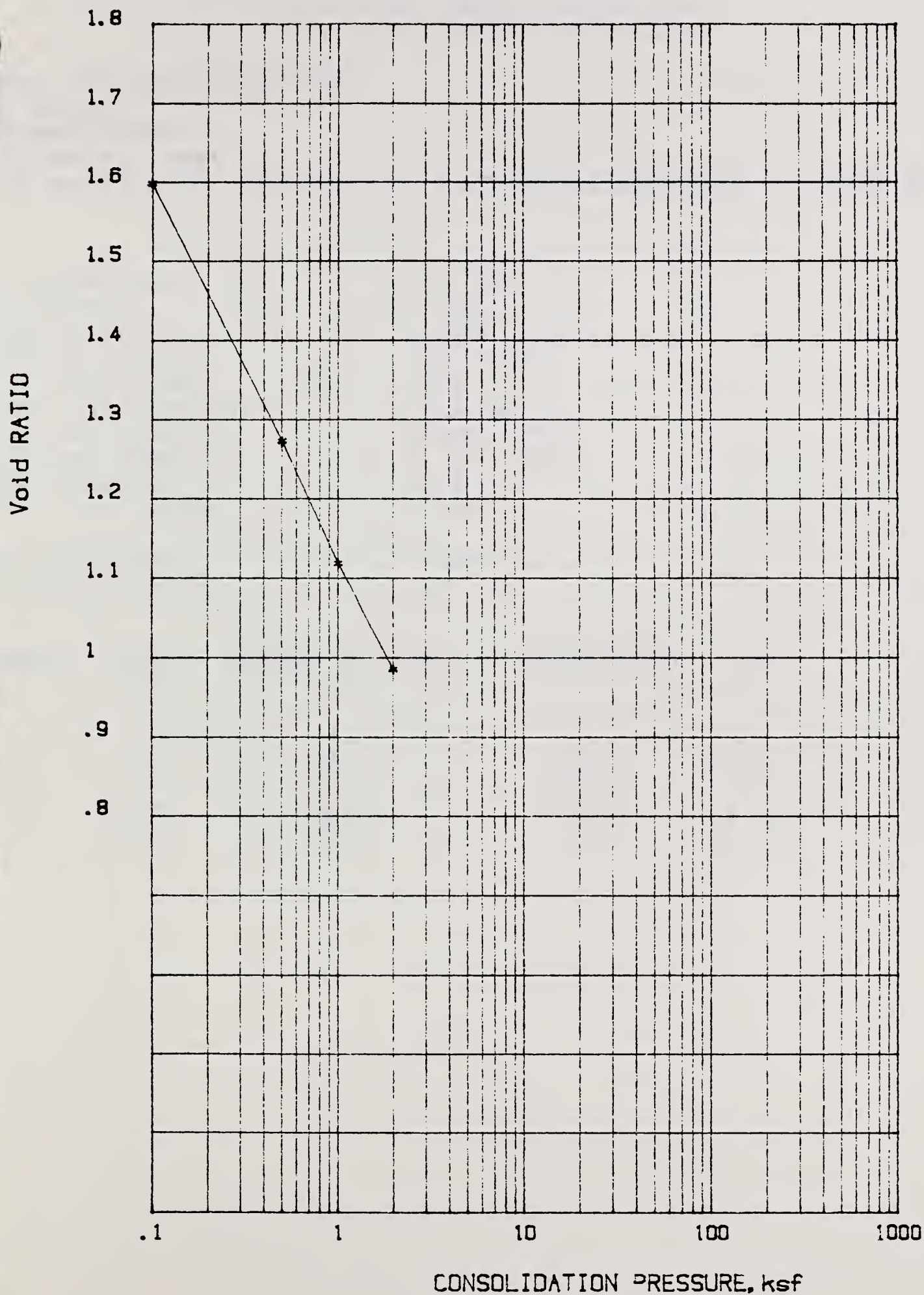
Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.





Test 2



Project: PIERRE-COTTONWOOD SD

LAB. NUMBER 88C97

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



# RESULTS OF CONSOLIDATION TEST

=====

Project: PALOUSE-PULLMAN WA.

Field number:

LAB.NUMBER 88C98

Sample depth: Feet

Sample description: COMPACTED TO 1.15 GMS/CC SATURATED AT START OF TEST

SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 104.17 g  
 INITIAL DRY WEIGHT: 92.51 g  
 INITIAL WATER CONTENT: 12.6 %  
 INITIAL WET DENSITY: 80.847 PCF  
 INITIAL DRY DENSITY: 71.797 PCF  
 SPECIFIC GRAVITY: 2.64  
 INITIAL VOID RATIO: 1.295

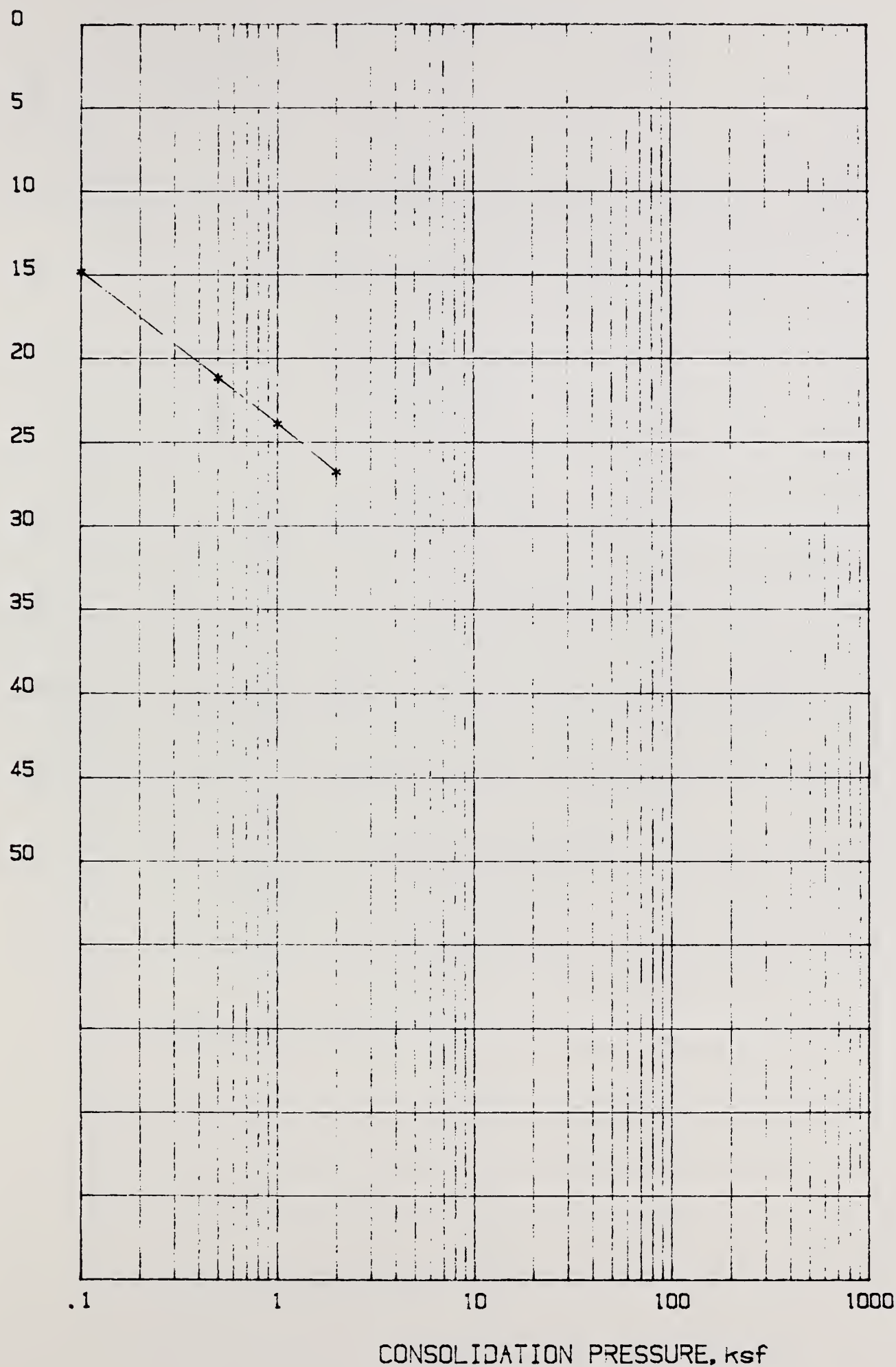
FINAL WET WEIGHT: 119.29 g  
 FINAL WATER CONTENT: 28.9 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	.1483	.9550	14.83
2.0	.50	.2123	.8080	21.23
3.0	1.00	.2395	.7450	23.95
4.0	2.00	.2683	.6790	26.83





PERCENT CONSOLIDATION-LAB. SAMPLE,



Project: PALOUSE-PULLMAN WA.

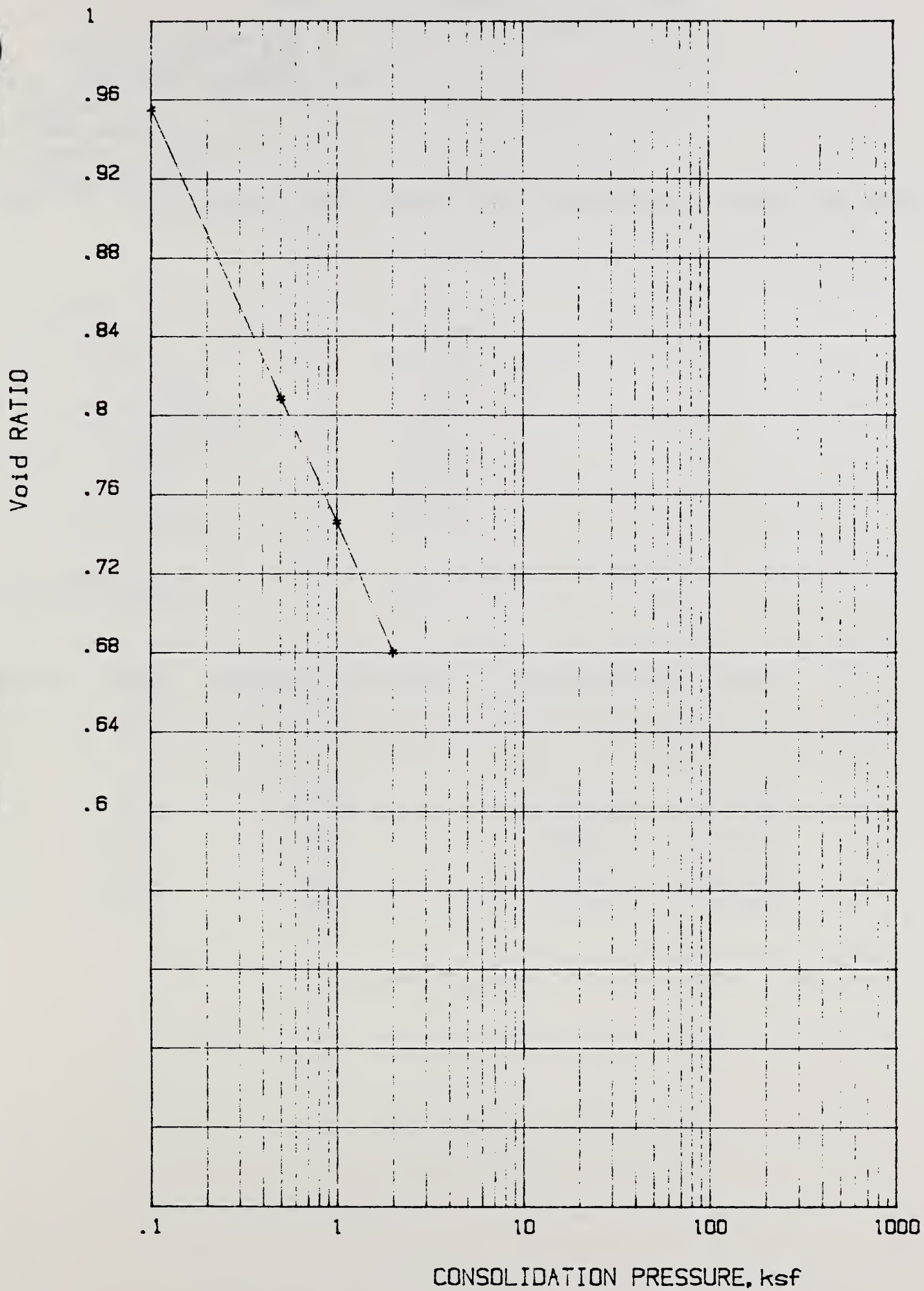
LAB. NUMBER 88C98

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





Project: PALOUSE-PULLMAN WA.

LAB. NUMBER 88C98

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





# RESULTS OF CONSOLIDATION TEST

WEPP Sample

Project: PORTNEUF-KIMBERLY ID.

Field number:

LAB.NUMBER 88C99

Sample depth: Feet

Sample description:

REMOLED TO 1.25 GM/CC CL-ML LL=28 PI=4 SATURATED AT START OF TEST

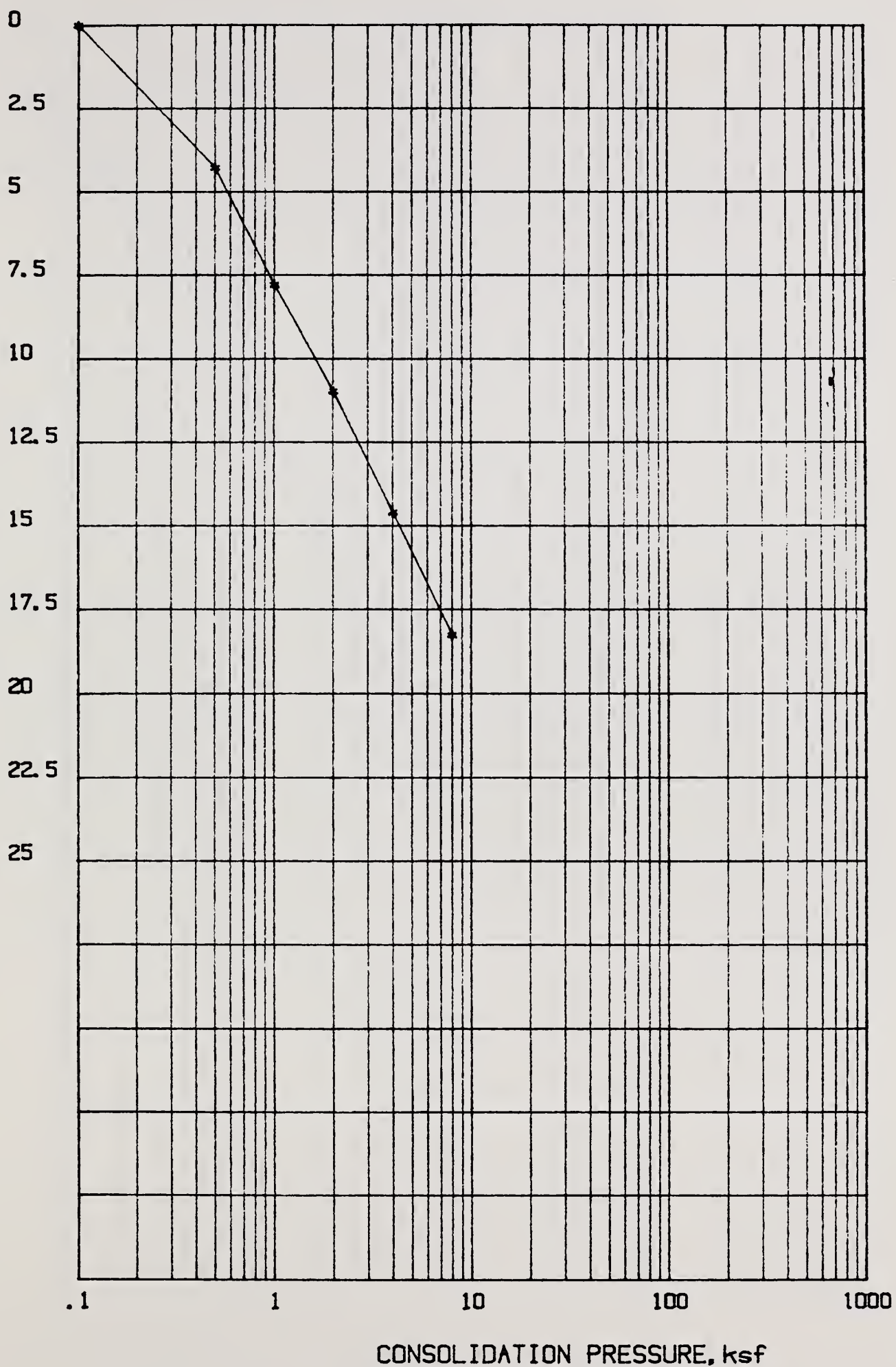
SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 116.42 g  
 INITIAL DRY WEIGHT: 100.55 g  
 INITIAL WATER CONTENT: 15.7 %  
 INITIAL WET DENSITY: 90.354 PCF  
 INITIAL DRY DENSITY: 78.037 PCF  
 SPECIFIC GRAVITY: 2.66  
 INITIAL VOID RATIO: 1.127

FINAL WET WEIGHT: 129.37 g  
 FINAL WATER CONTENT: 28.6 %

INCREMENT	LOAD (ksf)	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	0.0000	1.1270	0.00
2.0	.50	.0429	1.0360	4.29
3.0	1.00	.0781	.9610	7.81
4.0	2.00	.1100	.8930	11.00
5.0	4.00	.1463	.8160	14.63
6.0	8.00	.1830	.7380	18.30



PERCENT CONSOLIDATION-LAB. SAMPLE.



Project: PORTNEUF-KIMBERLY ID.

LAB. NUMBER 88C99

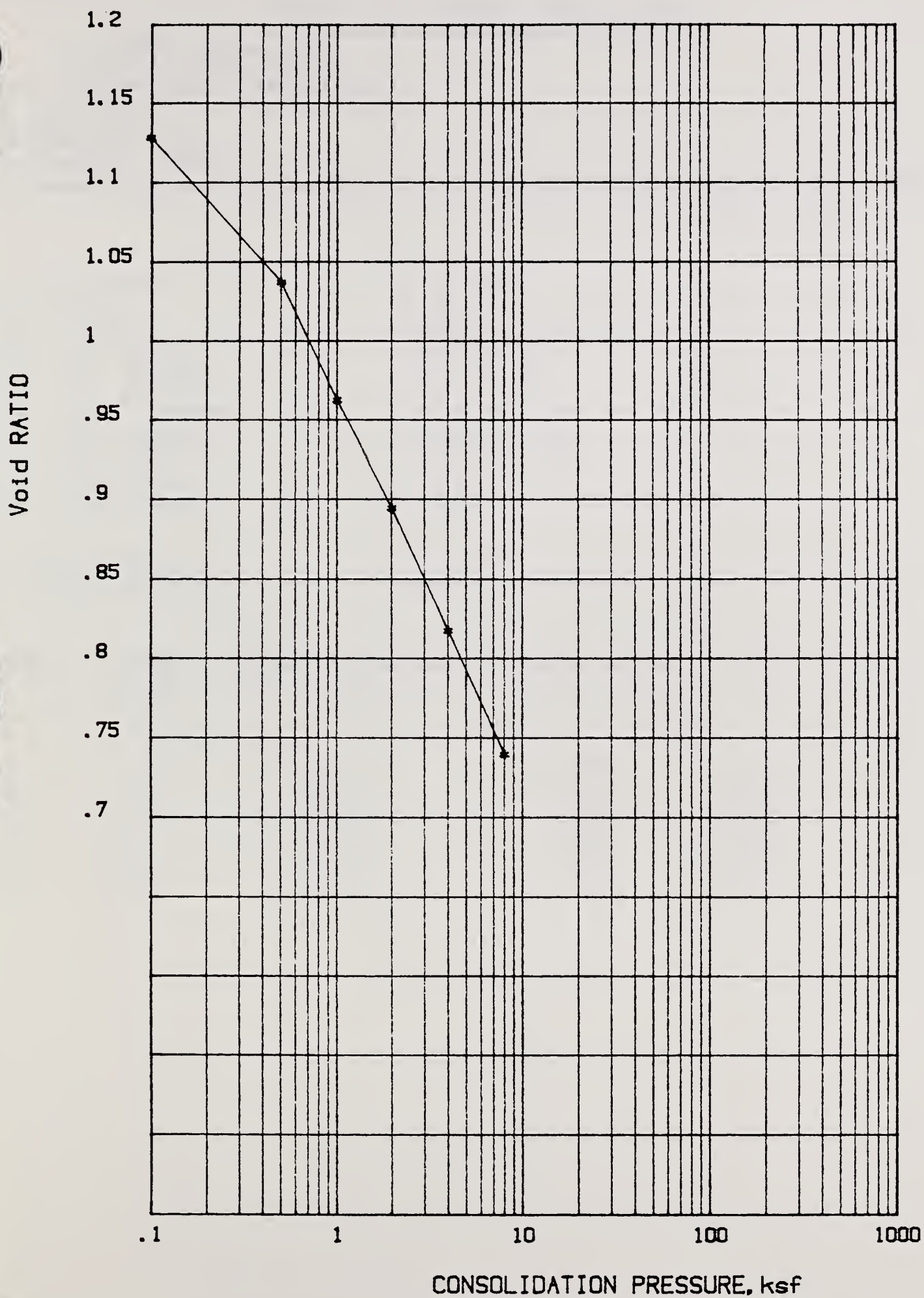
Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.







Project: PORTNEUF-KIMBERLY ID.

LAB. NUMBER 88C99

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



# RESULTS OF CONSOLIDATION TEST

*WEPP Sample*

Project: SHARPSBURG LINCON NE.

Field number:

LAB. NUMBER 88C100

Sample depth: Feet

Sample description: COMPACTED TO 1.14 GM/CC SATURATED AT START OF TEST

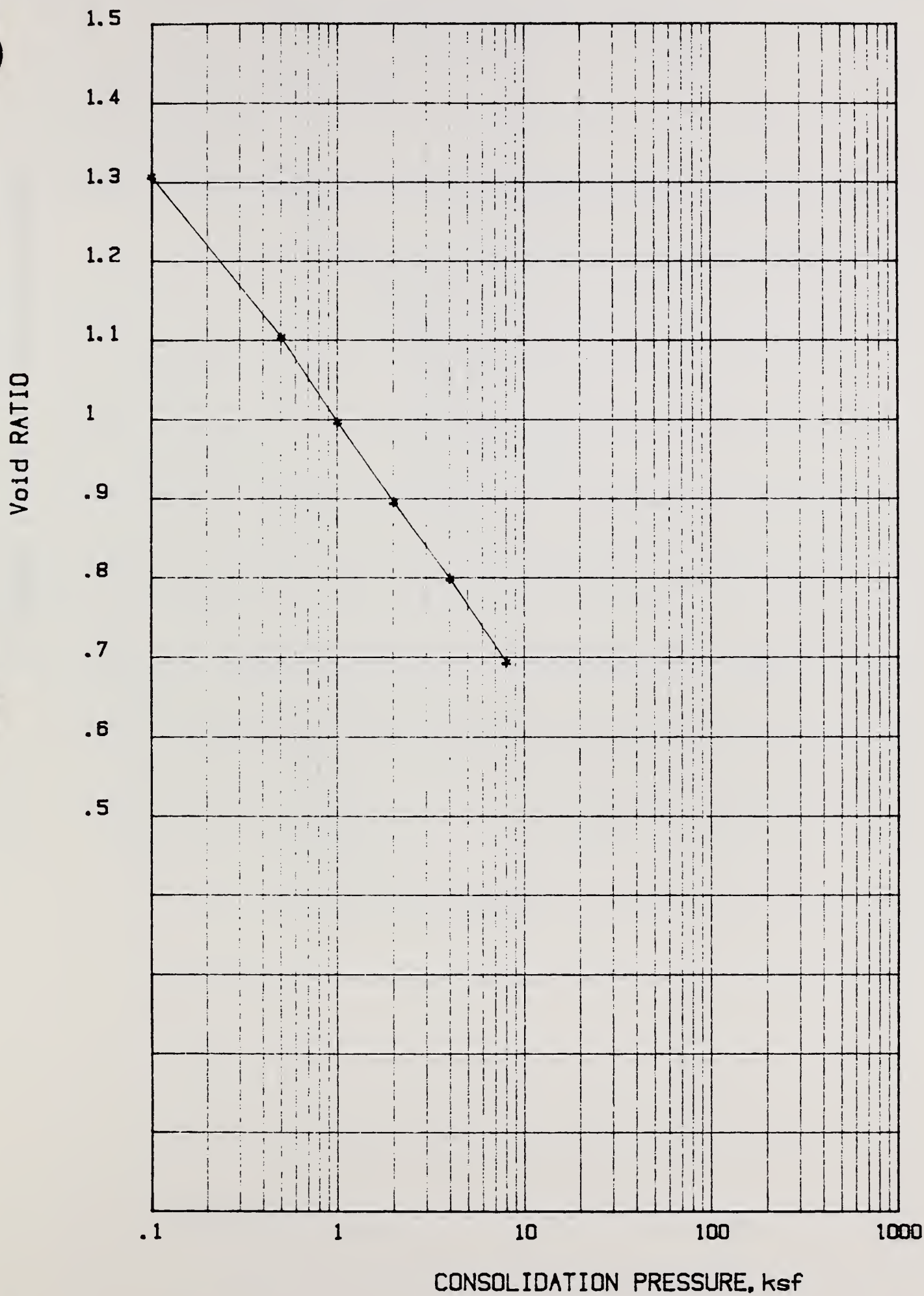
SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 109.98 g  
 INITIAL DRY WEIGHT: 91.7 g  
 INITIAL WATER CONTENT: 19.9 %  
 INITIAL WET DENSITY: 85.356 PCF  
 INITIAL DRY DENSITY: 71.169 PCF  
 SPECIFIC GRAVITY: 2.63  
 INITIAL VOID RATIO: 1.307

FINAL WET WEIGHT: 115.95 g  
 FINAL WATER CONTENT: 26.4 %

INCREMENT	LOAD (ksf)	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	0.0000	1.3070	0.00
2.0	.50	.0886	1.1020	8.86
3.0	1.00	.1350	.9950	13.50
4.0	2.00	.1789	.8940	17.89
5.0	4.00	.2209	.7970	22.09
6.0	8.00	.2666	.6910	26.66







Project: SHARPSBURG LINCON NE.

LAB. NUMBER 88C100

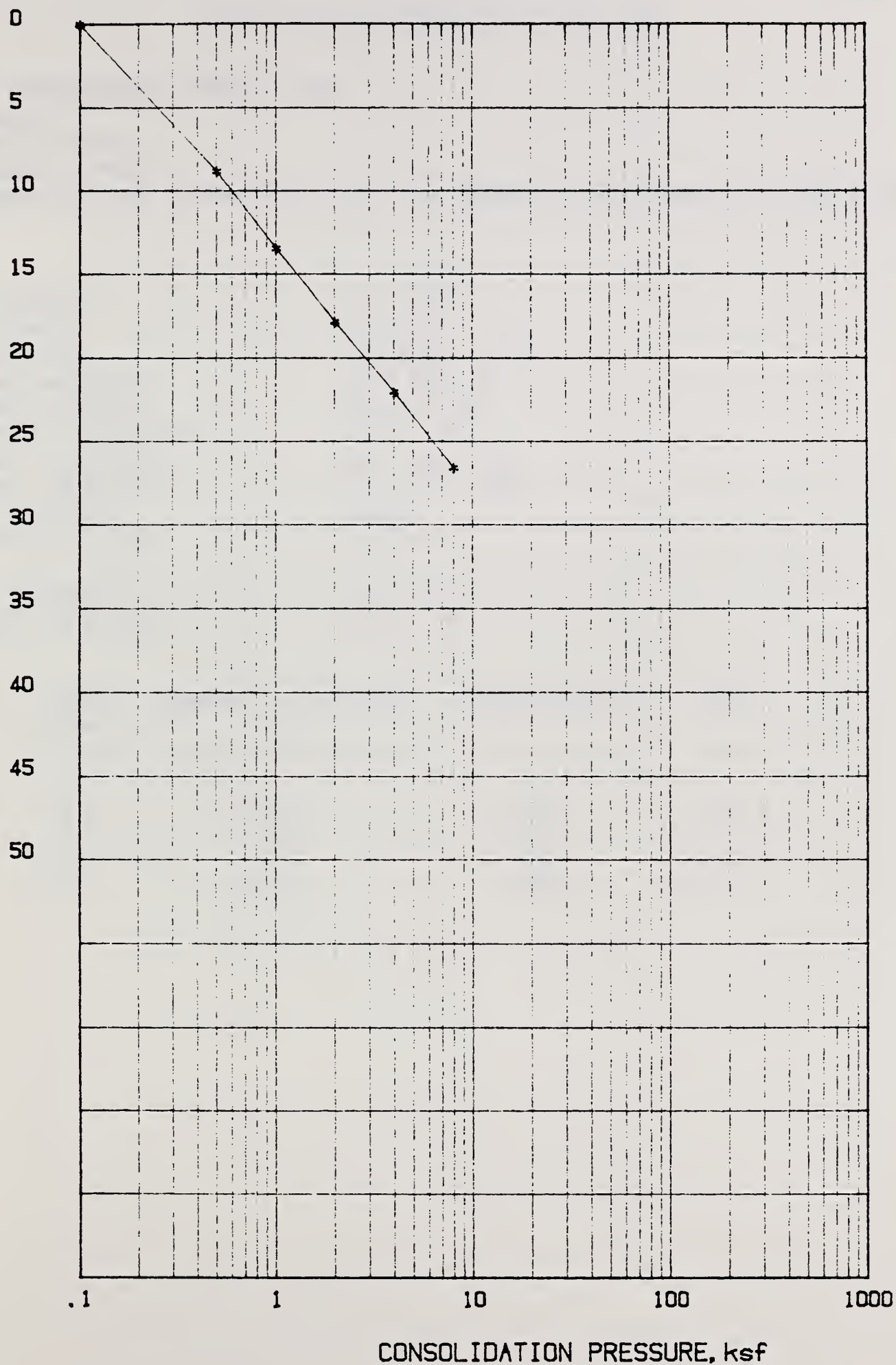
Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.



PERCENT CONSOLIDATION-LAB. SAMPLE.



Project: SHARPSBURG LINCON NE.

LAB. NUMBER 88C100

Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.





Test 2

RESULTS OF CONSOLIDATION TEST  
=====

Project: SHARPSBURG-LINCOLN NE

Field number:

LAB.NUMBER 88C100

Sample depth: Feet

Sample description: COMPACTED TO 1.14 GMS/CC SATURATED AT START OF TEST

SAMPLE DIAMETER: 2.5 ins  
SAMPLE HEIGHT: 1 ins  
INITIAL VOLUME: 80.439 cm<sup>3</sup>  
INITIAL WET WEIGHT: 107.87 g  
INITIAL DRY WEIGHT: 91.69 g  
INITIAL WATER CONTENT: 17.6 %  
INITIAL WET DENSITY: 83.718 PCF  
INITIAL DRY DENSITY: 71.161 PCF  
SPECIFIC GRAVITY: 2.63  
INITIAL VOID RATIO: 1.307

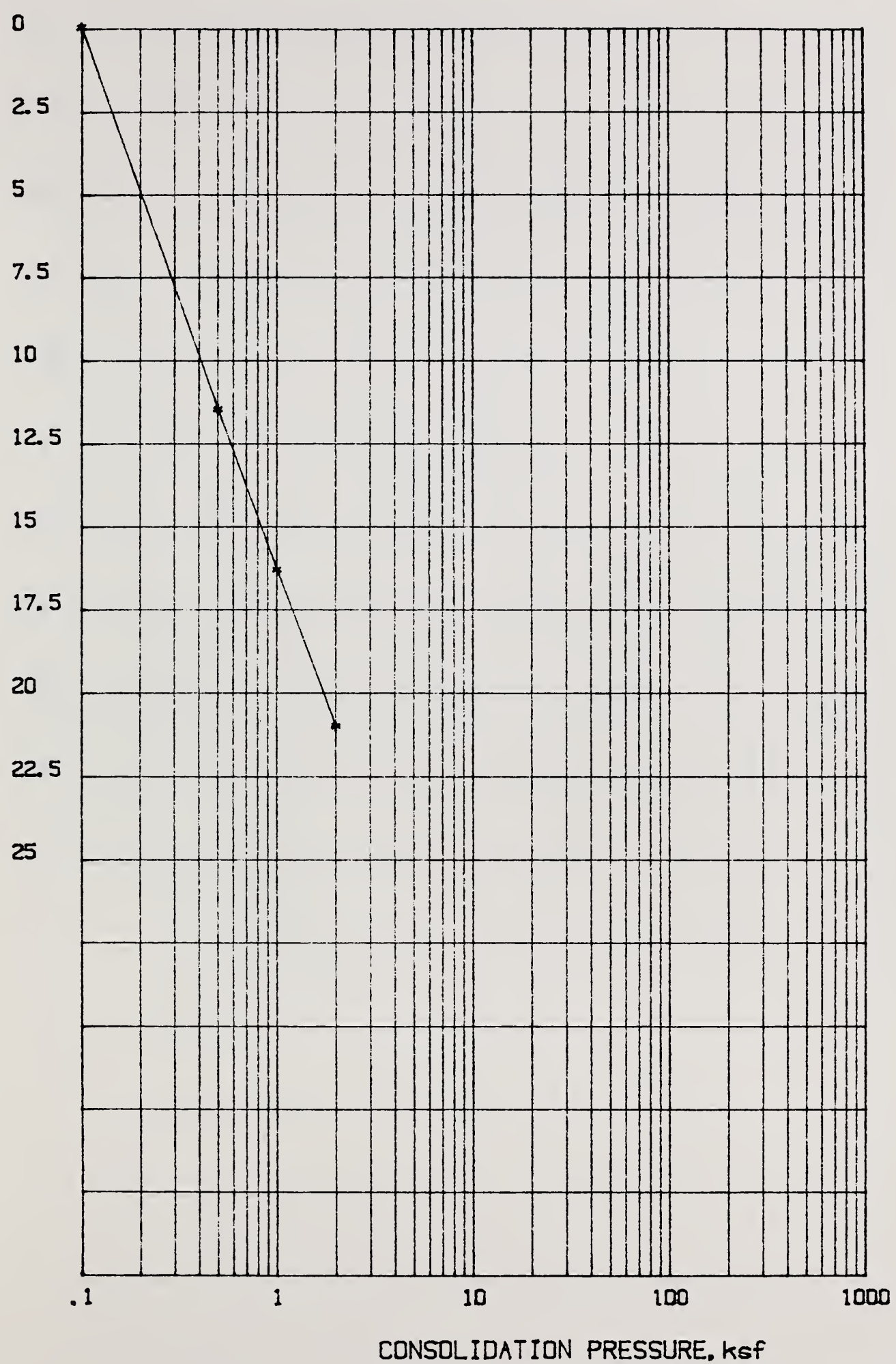
FINAL WET WEIGHT: 121.47 g  
FINAL WATER CONTENT: 32.4 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	-.0005	1.3080	-.05
2.0	.50	.1148	1.0420	11.48
3.0	1.00	.1632	.9300	16.32
4.0	2.00	.2102	.8220	21.02



Test 2

PERCENT CONSOLIDATION-LAB. SAMPLE.



Project: SHARPSBURG-LINCOLN NE

LAB. NUMBER 88C100

Field number:

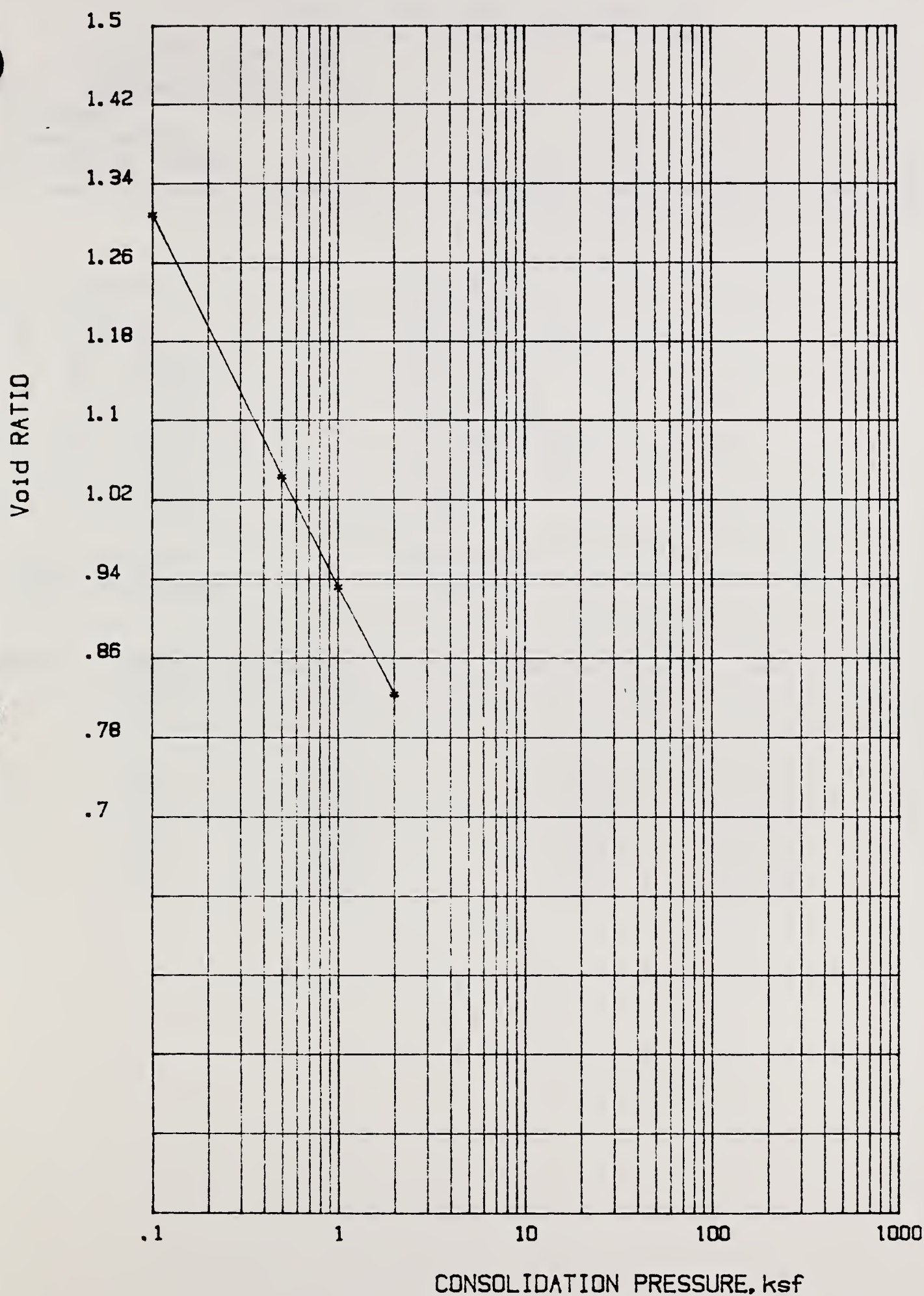
Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





Test 2



Project: SHARPSBURG-LINCOLN NE

LAB. NUMBER 88C100

Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.



# RESULTS OF CONSOLIDATION TEST

WEPP Sample

Project: SVERDRUP-MORRIS MN.

Field number:

LAB. NUMBER 88C101

Sample depth: Feet

Sample description: COMPACTED TO 1.46 GM/CC SATURATED AT START OF TEST

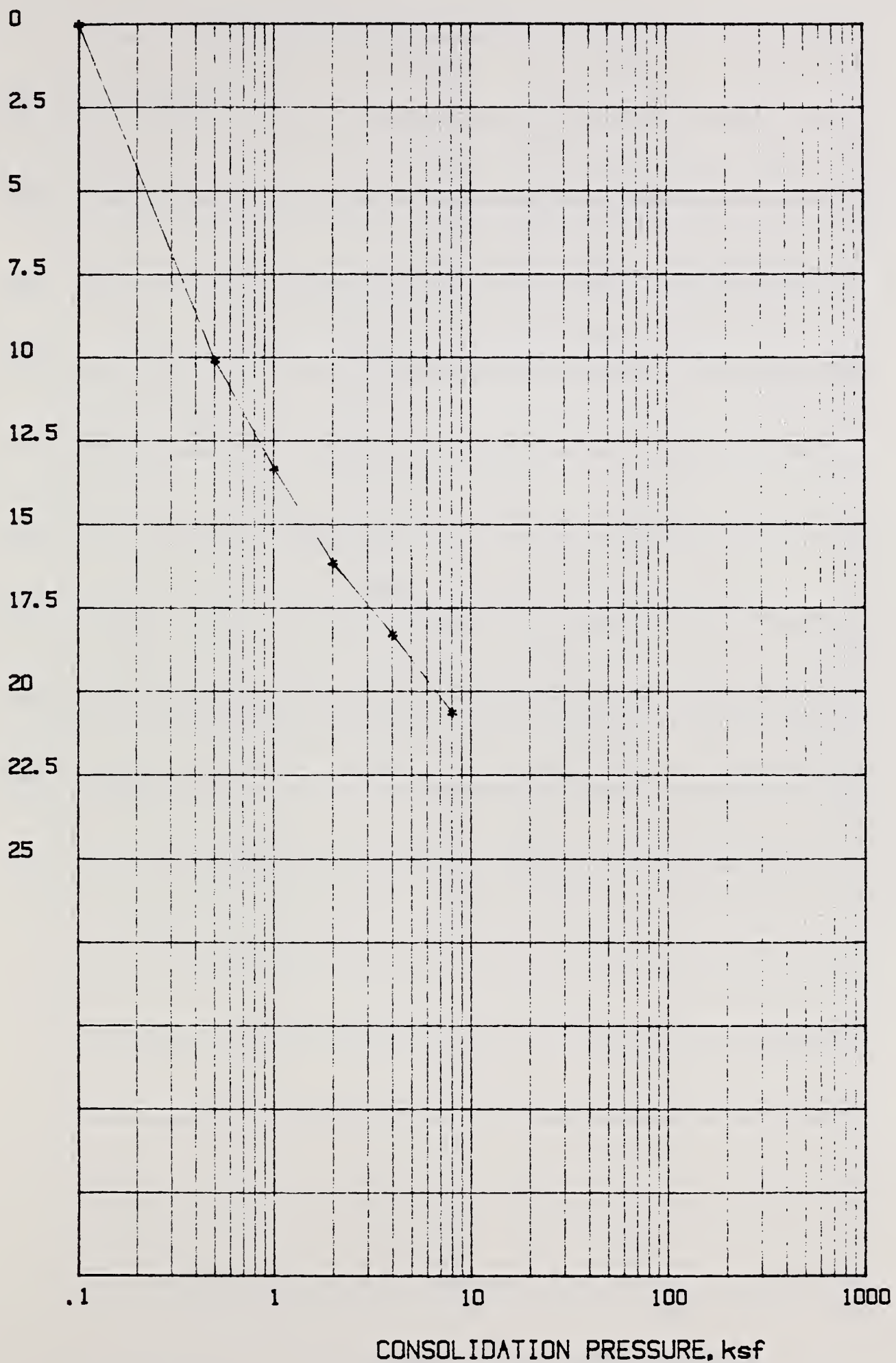
SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 129.4 g  
 INITIAL DRY WEIGHT: 117.41 g  
 INITIAL WATER CONTENT: 10.2 %  
 INITIAL WET DENSITY: 100.428 PCF  
 INITIAL DRY DENSITY: 91.122 PCF  
 SPECIFIC GRAVITY: 2.63  
 INITIAL VOID RATIO: .801

FINAL WET WEIGHT: 137.53 g  
 FINAL WATER CONTENT: 17.1 %

INCREMENT	LOAD (ksf)	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	0.0000	.8010	0.00
2.0	.50	.1011	.6190	10.11
3.0	1.00	.1336	.5610	13.36
4.0	2.00	.1617	.5100	16.17
5.0	4.00	.1833	.4710	18.33
6.0	8.00	.2068	.4290	20.68



PERCENT CONSOLIDATION-LAB. SAMPLE,



Project: SVERDRUP-MORRIS MN.

LAB. NUMBER 88C101

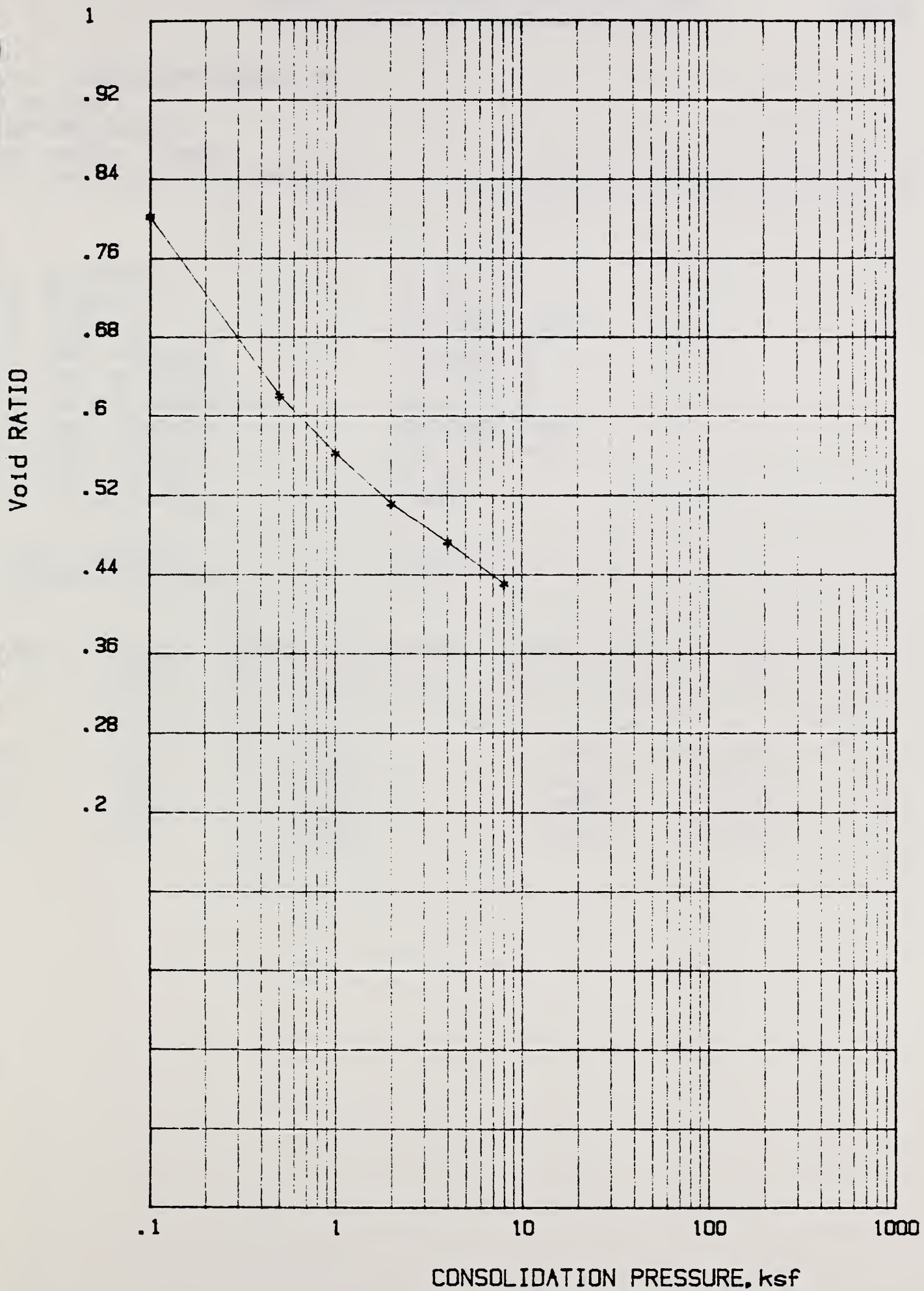
Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.







Project: SVERDRUP-MORRIS MN.

LAB. NUMBER 88C101

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



# RESULTS OF CONSOLIDATION TEST

Test 2

Project: SVERDROP-MORRIS MN

Field number:

LAB.NUMBER 88C101

Sample depth: Feet

Sample description: COMPACTED TO 1.46 GMS/CC SATURATED AT START OF TEST

SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 123.55 g  
 INITIAL DRY WEIGHT: 117.44 g  
 INITIAL WATER CONTENT: 5.2 %  
 INITIAL WET DENSITY: 95.888 PCF  
 INITIAL DRY DENSITY: 91.146 PCF  
 SPECIFIC GRAVITY: 2.63  
 INITIAL VOID RATIO: .801

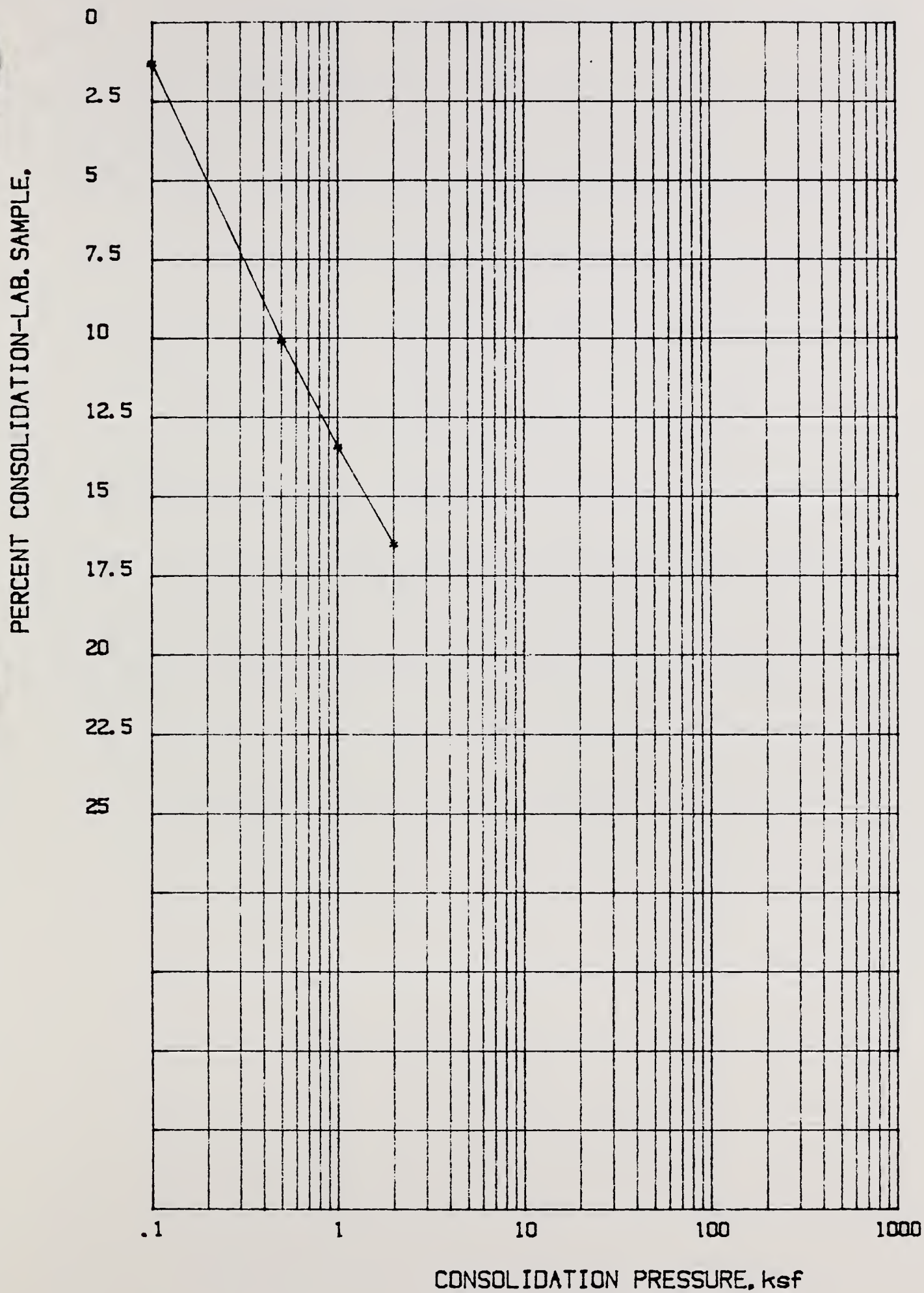
FINAL WET WEIGHT: 139.69 g  
 FINAL WATER CONTENT: 18.9 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	.0131	.7770	1.31
2.0	.50	.1009	.6190	10.09
3.0	1.00	.1346	.5580	13.46
4.0	2.00	.1655	.5030	16.55





Test 2



Project: SVERDROP-MORRIS MN

LAB. NUMBER 88C101

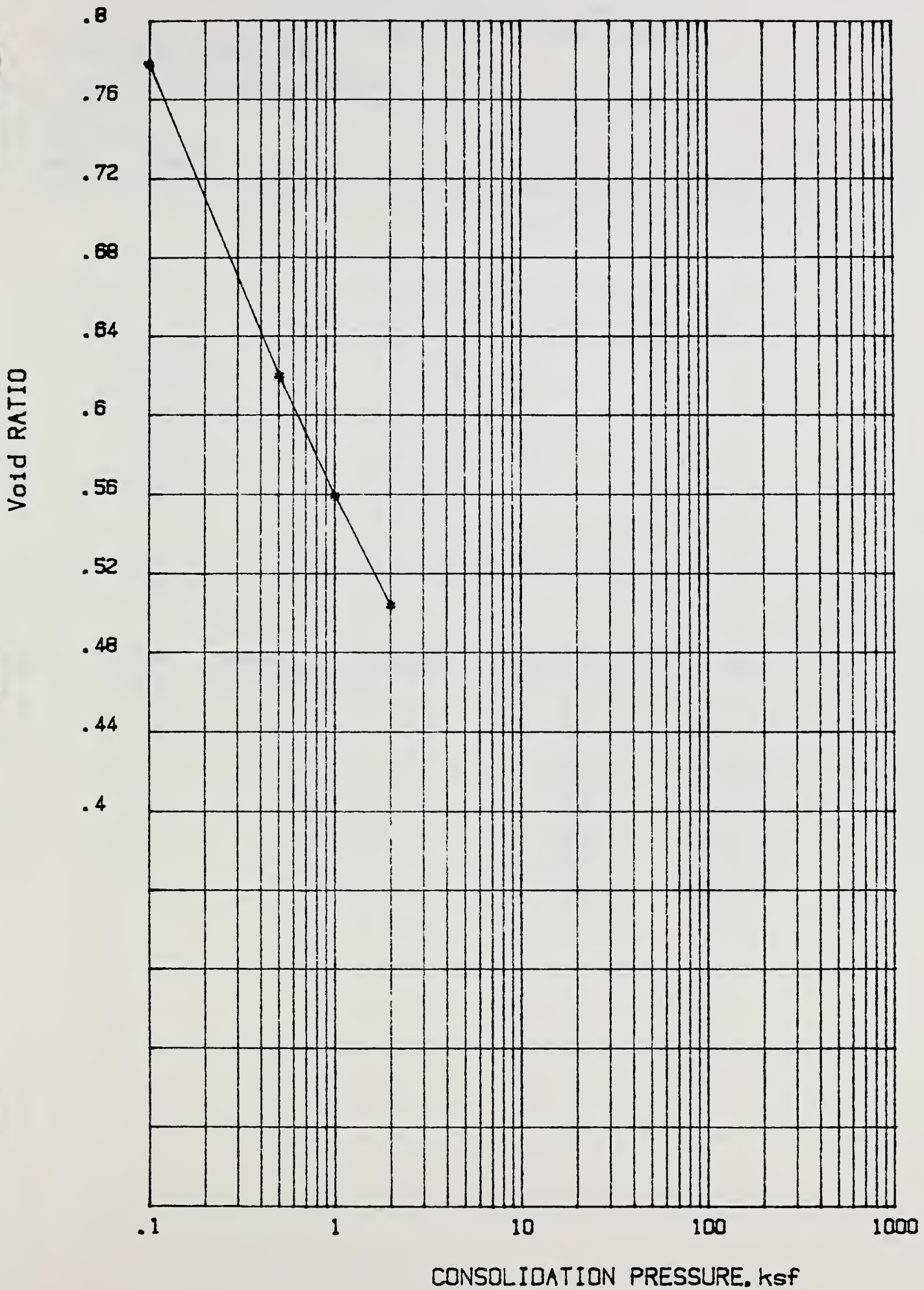
Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



Test 3



Project: SVERDROP-MORRIS MN

LAB. NUMBER 88C101

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.

Section 1		Section 2		Section 3		Section 4		Section 5	
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310
311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370
371	372	373	374	375	376	377	378	379	380
381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400
401	402	403	404	405	406	407	408	409	410
411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430
431	432	433	434	435	436	437	438	439	440
441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460
461	462	463	464	465	466	467	468	469	470
471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490
491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510
511	512	513	514	515	516	517	518	519	520
521	522	523	524	525	526	527	528	529	530
531	532	533	534	535	536	537	538	539	540
541	542	543	544	545	546	547	548	549	550
551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569	570
571	572	573	574	575	576	577	578	579	580
581	582	583	584	585	586	587	588	589	590
591	592	593	594	595	596	597	598	599	600
601	602	603	604	605	606	607	608	609	610
611	612	613	614	615	616	617	618	619	620
621	622	623	624	625	626	627	628	629	630
631	632	633	634	635	636	637	638	639	640
641	642	643	644	645	646	647	648	649	650
651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670
671	672	673	674	675	676	677	678	679	680
681	682	683	684	685	686	687	688	689	690
691	692	693	694	695	696	697	698	699	700
701	702	703	704	705	706	707	708	709	710
711	712	713	714	715	716	717	718	719	720
721	722	723	724	725	726	727	728	729	730
731	732	733	734	735	736	737	738	739	740
741	742	743	744	745	746	747	748	749	750
751	752	753	754	755	756	757	758	759	760
761	762	763	764	765	766	767	768	769	770
771	772	773	774	775	776	777	778	779	780
781	782	783	784	785	786	787	788	789	790
791	792	793	794	795	796	797	798	799	800
801	802	803	804	805	806	807	808	809	810
811	812	813	814	815	816	817	818	819	820
821	822	823	824	825	826	827	828	829	830
831	832	833	834	835	836	837	838	839	840
841	842	843	844	845	846	847	848	849	850
851	852	853	854	855	856	857	858	859	860
861	862	863	864	865	866	867	868	869	870
871	872	873	874	875	876	877	878	879	880
881	882	883	884	885	886	887	888	889	890
891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910
911	912	913	914	915	916	917	918	919	920
921	922	923	924	925	926	927	928	929	930
931	932	933	934	935	936	937	938	939	940
941	942	943	944	945	946	947	948	949	950
951	952	953	954	955	956	957	958	959	960
961	962	963	964	965	966	967	968	969	970
971	972	973	974	975	976	977	978	979	980
981	982	983	984	985	986	987	988	989	990
991	992	993	994	995	996	997	998	999	1000

# RESULTS OF CONSOLIDATION TEST

WEPP Sample

Project: WALLA WALLA-PULLMAN WA.

Field number:

LAB.NUMBER 88C102

Sample depth: Feet

Sample description: COMPACTED TO 1.25 GM/CC CL/ML LL=38 PI=4

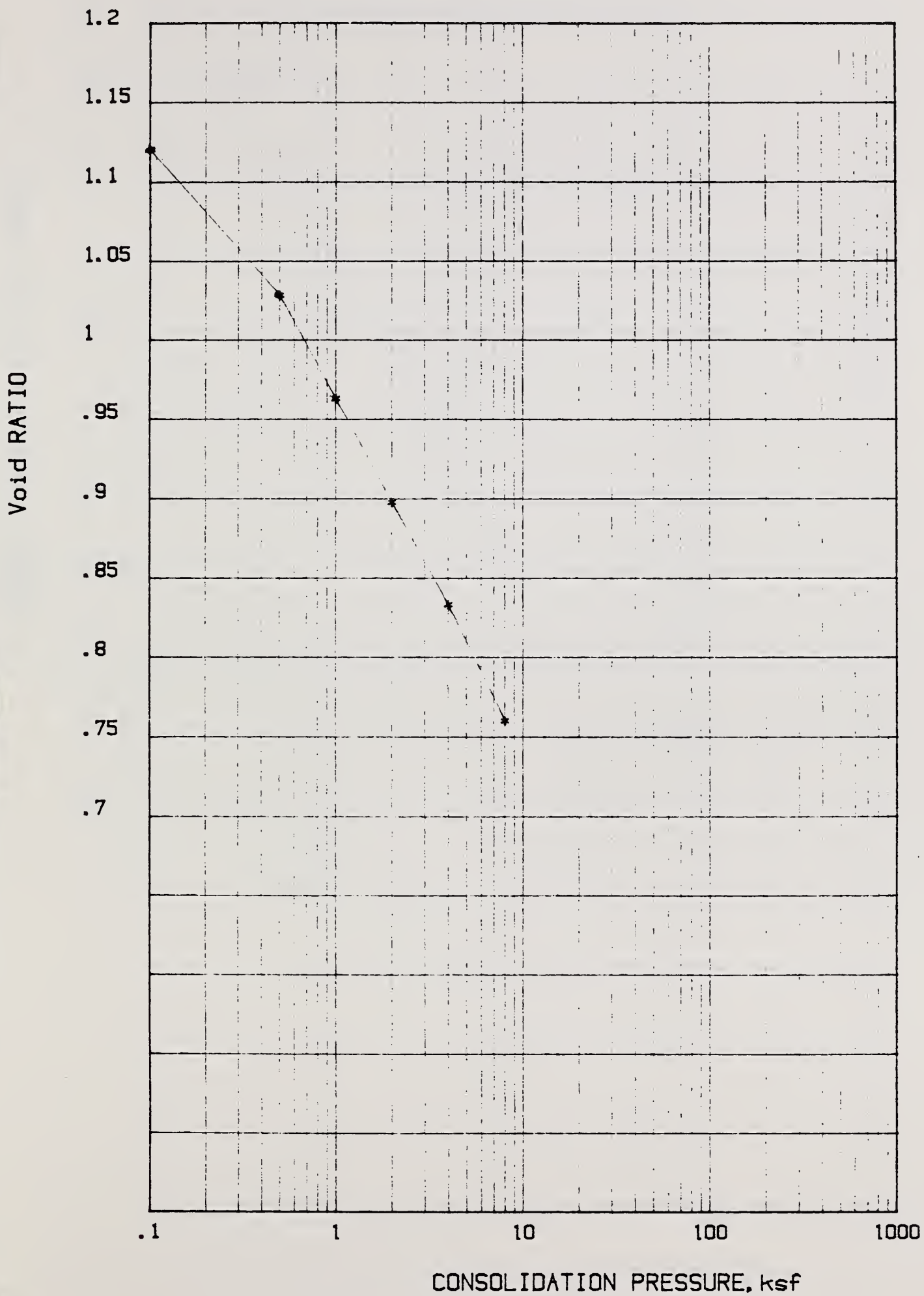
SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 114.22 g  
 INITIAL DRY WEIGHT: 100.53 g  
 INITIAL WATER CONTENT: 13.6 %  
 INITIAL WET DENSITY: 88.647 PCF  
 INITIAL DRY DENSITY: 78.022 PCF  
 SPECIFIC GRAVITY: 2.65  
 INITIAL VOID RATIO: 1.12

FINAL WET WEIGHT: 131.72 g  
 FINAL WATER CONTENT: 31 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	0.0000	1.1200	0.00
2.0	.50	.0435	1.0280	4.35
3.0	1.00	.0746	.9620	7.46
4.0	2.00	.1057	.8970	10.53
5.0	4.00	.1359	.8320	13.59
6.0	8.00	.1704	.7590	17.04







Project: WALLA WALLA-PULLMAN WA.

LAB. NUMBER 88C102

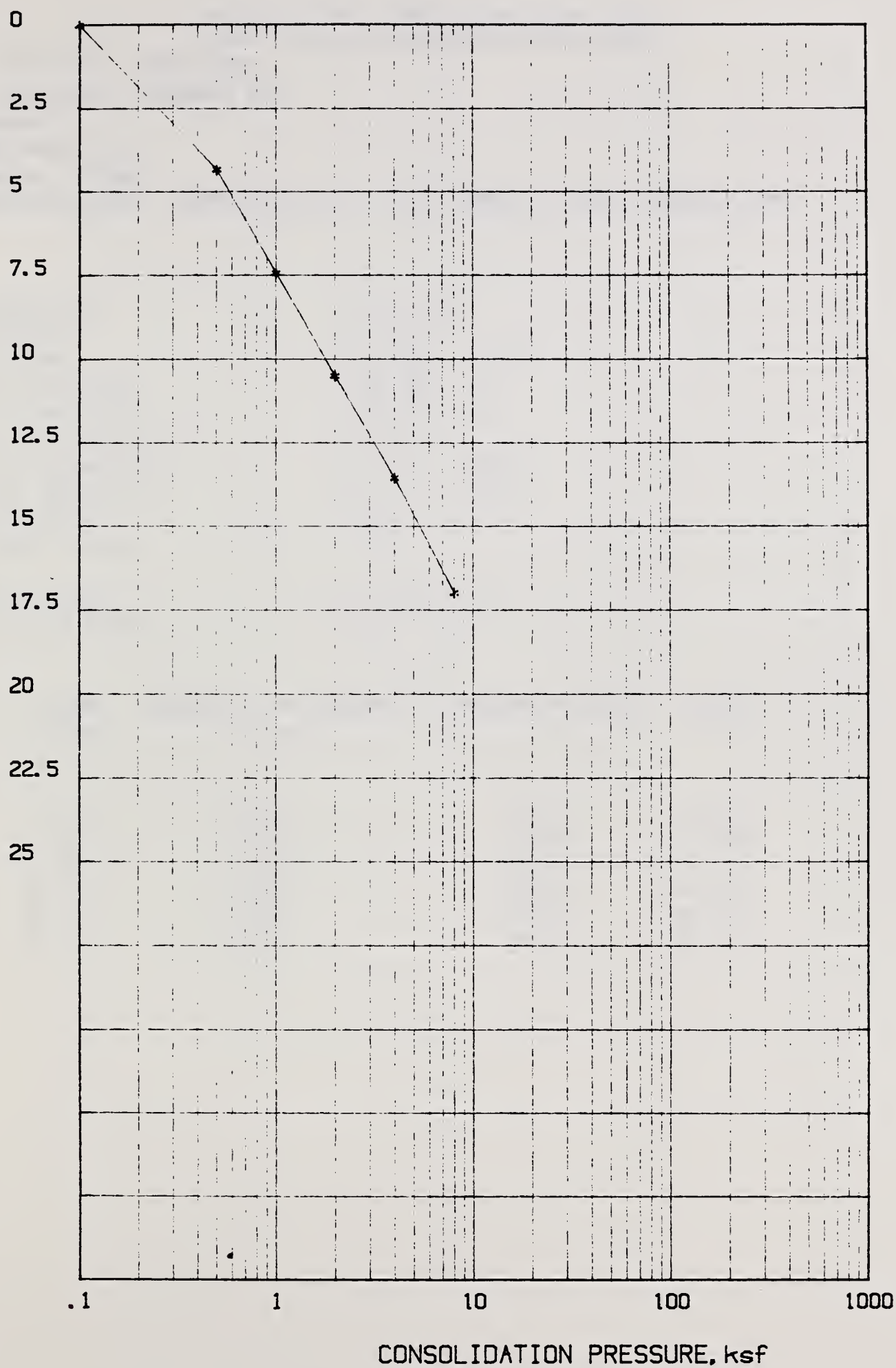
Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.



PERCENT CONSOLIDATION-LAB. SAMPLE.



Project: WALLA WALLA-PULLMAN WA.

LAB. NUMBER 88C102

Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.





# RESULTS OF CONSOLIDATION TEST

=====

WEPP Sample

Project: WHITNEY--FRESNO CA.

Field number:

LAB.NUMBER 88C103

Sample depth: Feet

Sample description: COMPACTED TO 1.54 GMW/CC NON-PLASTIC SM

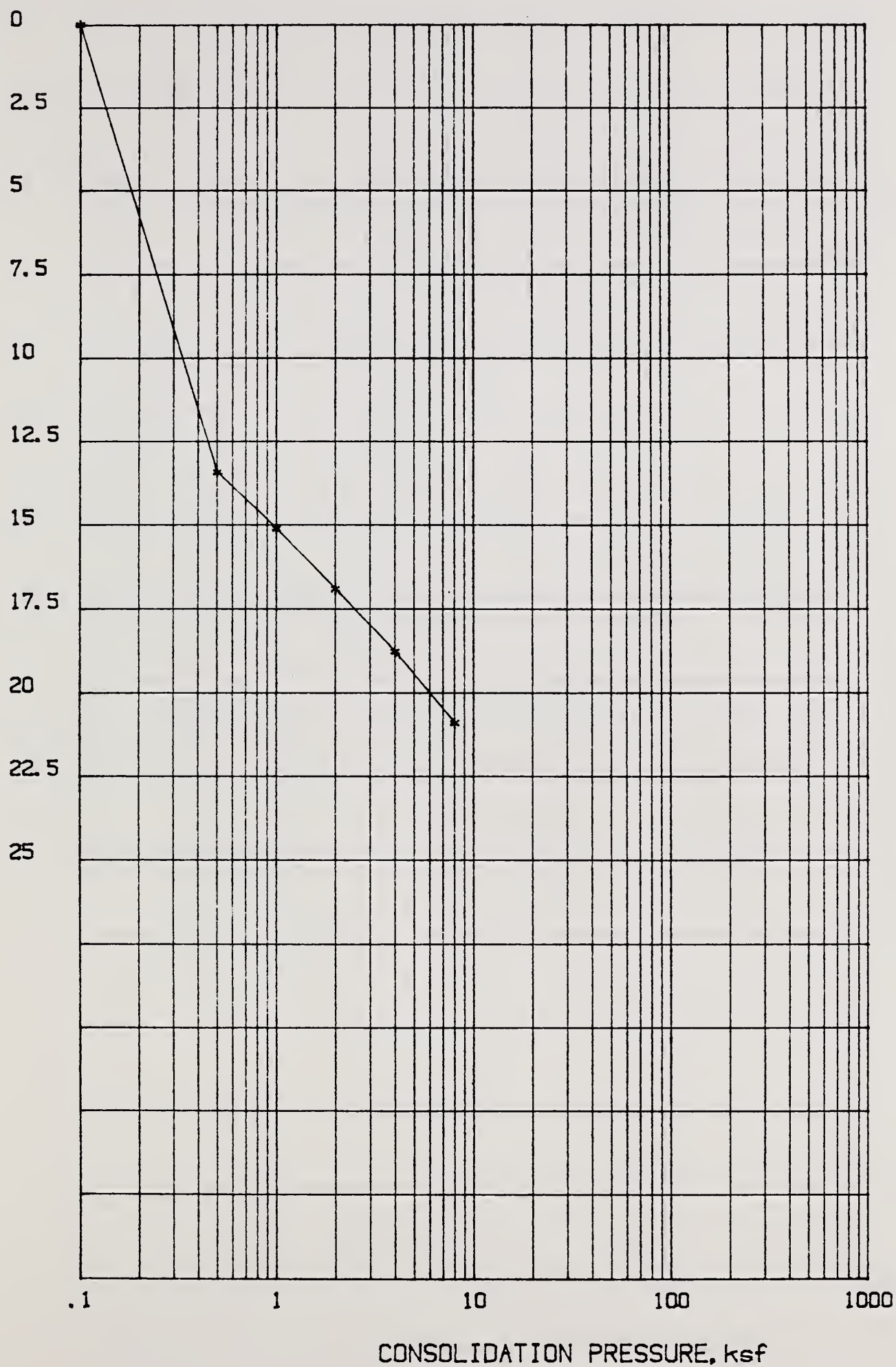
SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 130.82 g  
 INITIAL DRY WEIGHT: 123.85 g  
 INITIAL WATER CONTENT: 5.6 %  
 INITIAL WET DENSITY: 101.53 PCF  
 INITIAL DRY DENSITY: 96.121 PCF  
 SPECIFIC GRAVITY: 2.67  
 INITIAL VOID RATIO: .734

FINAL WET WEIGHT: 141.59 g  
 FINAL WATER CONTENT: 14.3 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	0.0000	.7340	0.00
2.0	.50	.1345	.5000	13.45
3.0	1.00	.1514	.4710	15.14
4.0	2.00	.1694	.4400	16.94
5.0	4.00	.1880	.4080	18.80
6.0	8.00	.2094	.3710	20.94



PERCENT CONSOLIDATION-LAB. SAMPLE.



Project: WHITNEY--FRESNO CA.

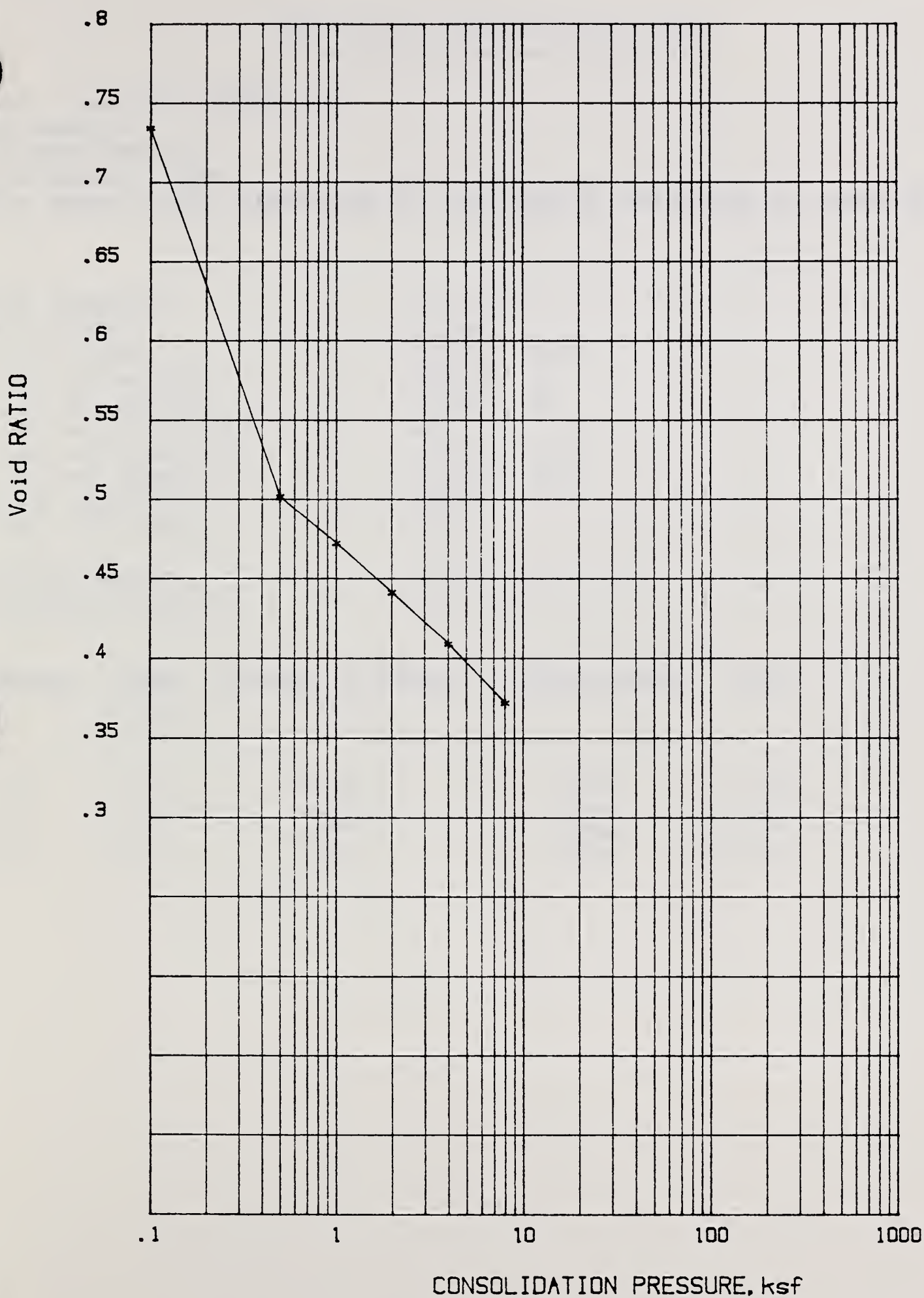
LAB. NUMBER 88C103

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





Project: WHITNEY--FRESNO CA.

LAB. NUMBER 88C103

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





Test 2

RESULTS OF CONSOLIDATION TEST

=====

Project: WHITNEY-FRESNO CA

Field number:

LAB. NUMBER 88C103

Sample depth: Feet

Sample description: COMPACTED TO 1.54 GMS/CC SATURATED AT START OF TEST

SAMPLE DIAMETER: 2.5 ins  
SAMPLE HEIGHT: 1 ins  
INITIAL VOLUME: 80.439 cm<sup>3</sup>  
INITIAL WET WEIGHT: 134.07 g  
INITIAL DRY WEIGHT: 123.87 g  
INITIAL WATER CONTENT: 8.2 %  
INITIAL WET DENSITY: 104.052 PCF  
INITIAL DRY DENSITY: 96.136 PCF  
SPECIFIC GRAVITY: 2.67  
INITIAL VOID RATIO: .733

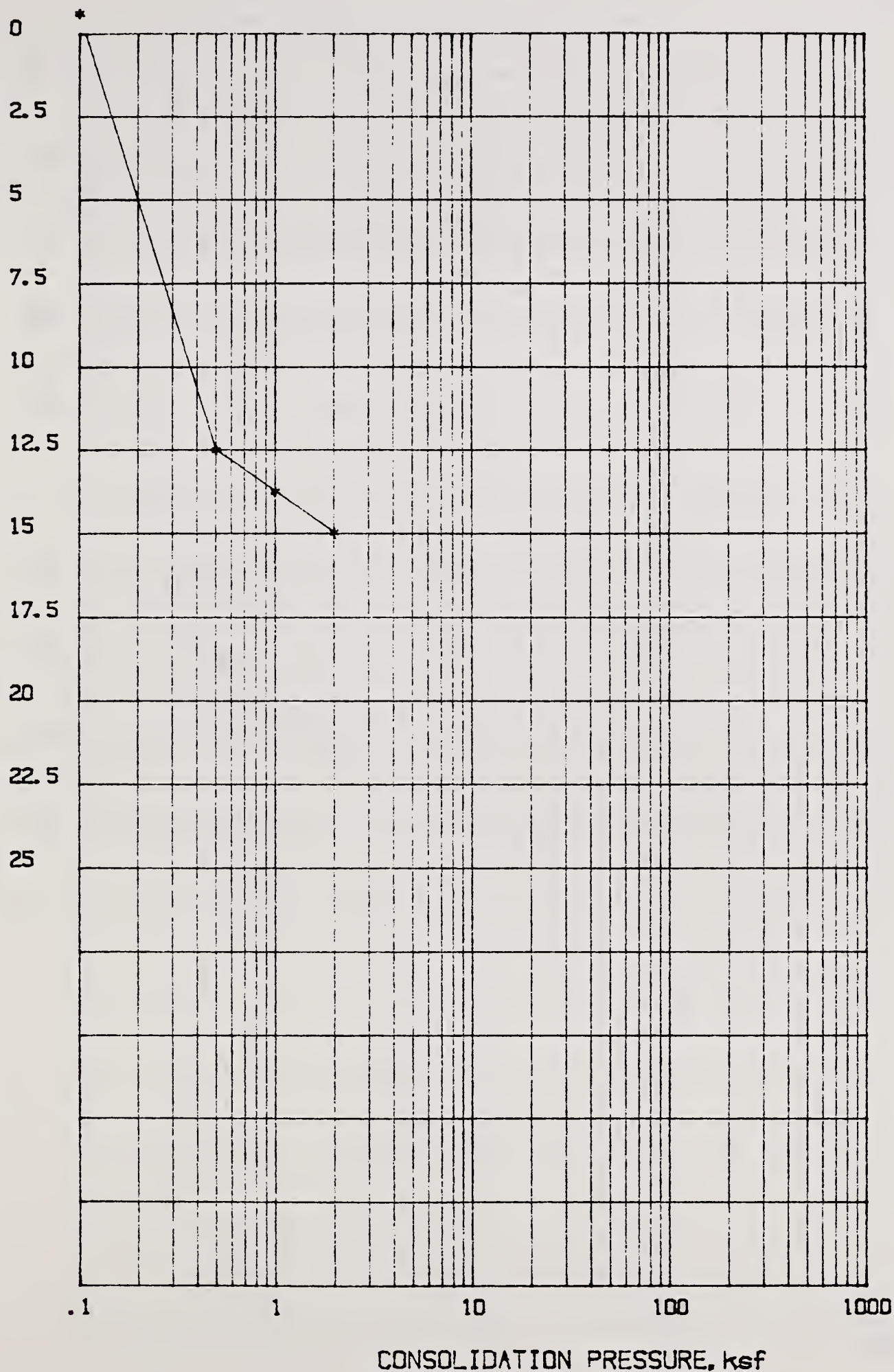
FINAL WET WEIGHT: 142.73 g  
FINAL WATER CONTENT: 15.2 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	-.0063	.7440	-.63
2.0	.50	.1252	.5160	12.52
3.0	1.00	.1377	.4950	13.77
4.0	2.00	.1500	.4730	15.00



Test 2

PERCENT CONSOLIDATION-LAB. SAMPLE.



Project: WHITNEY-FRESNO CA

LAB. NUMBER 88C103

Field number:

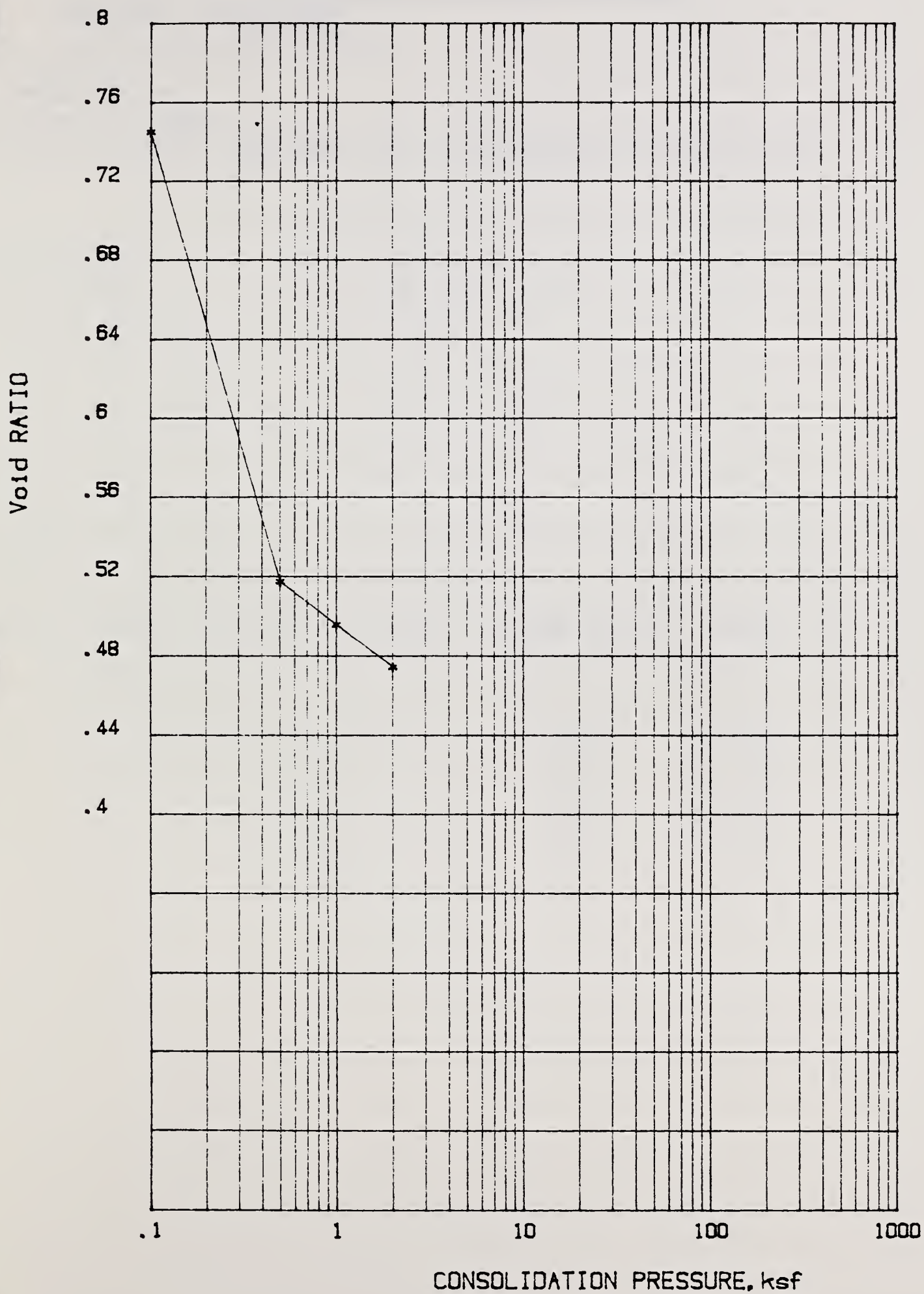
Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.





Test 2



Project: WHITNEY-FRESNO CA

LAB. NUMBER 88C103

Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.



# RESULTS OF CONSOLIDATION TEST

WEPP - sample

Project: WILLIAMS- McDUSKY ND.

Field number:

LAB. NUMBER 88C104

Sample depth: Feet

Sample description: REMOLDED TO 1.16 GMS/CC CL LL=37 PI=19

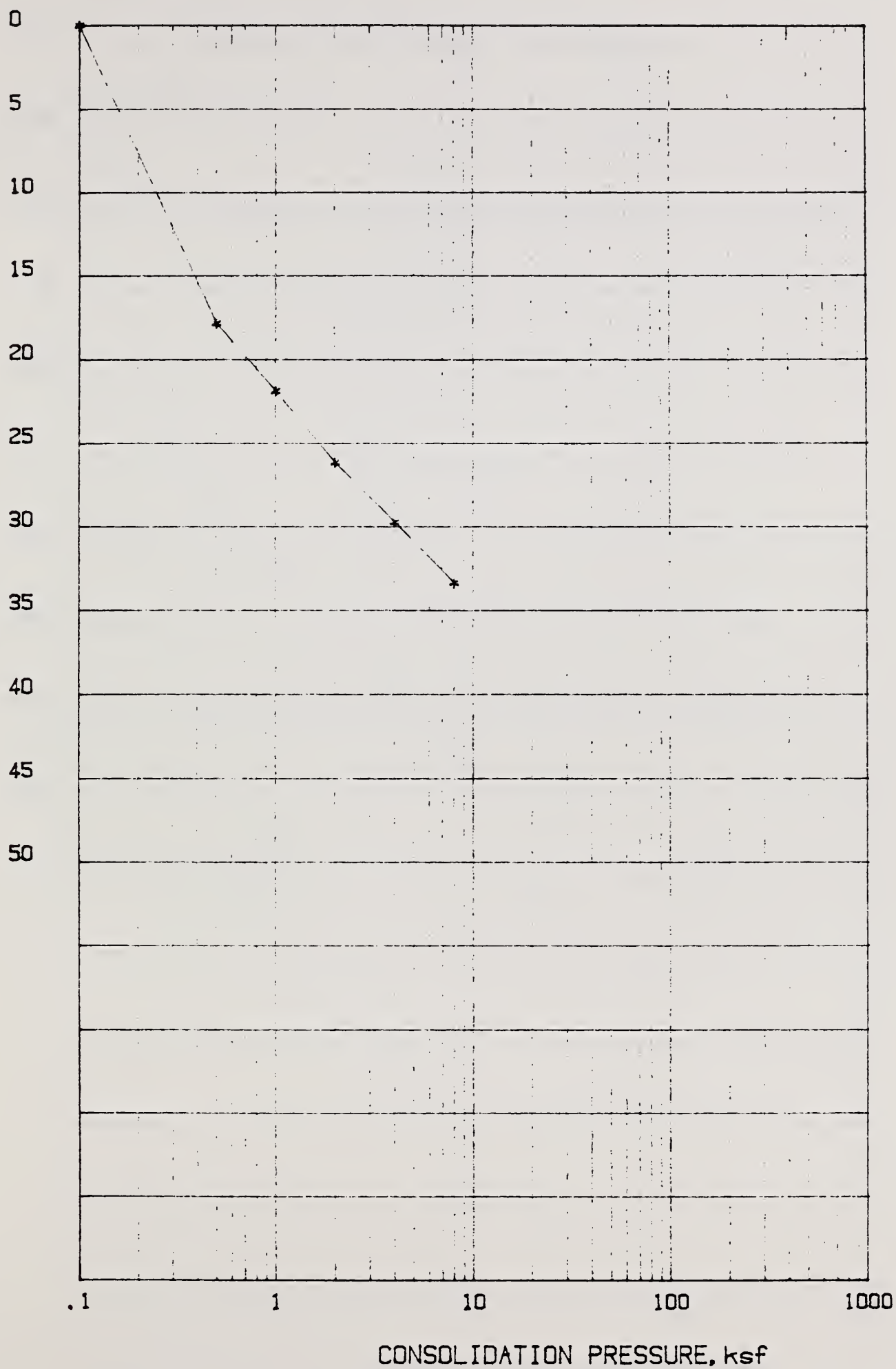
SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 106.99 g  
 INITIAL DRY WEIGHT: 93.3 g  
 INITIAL WATER CONTENT: 14.6 %  
 INITIAL WET DENSITY: 93.035 PCF  
 INITIAL DRY DENSITY: 79.41 PCF  
 APPARENT UNIT WEIGHT: 3.59  
 INITIAL VOID RATIO: 1.233

FINAL WET WEIGHT: 111.9 g  
 FINAL WATER CONTENT: 15.9 %

INCREMENT	LOAD	CHANGE IN HEIGHT	VOIDS RATIO	Su%
0	0	0	1.2330	0.00
1	100	0.07	1.0330	17.85
2	200	0.07	0.7430	21.93
3	300	0.07	0.6470	26.20
4	400	0.07	0.5680	29.75
5	500	0.07	0.4860	33.43



PERCENT CONSOLIDATION-LAB. SAMPLE.



Project: WILLIAMS- McCLUSKY ND.

LAB. NUMBER 88C104

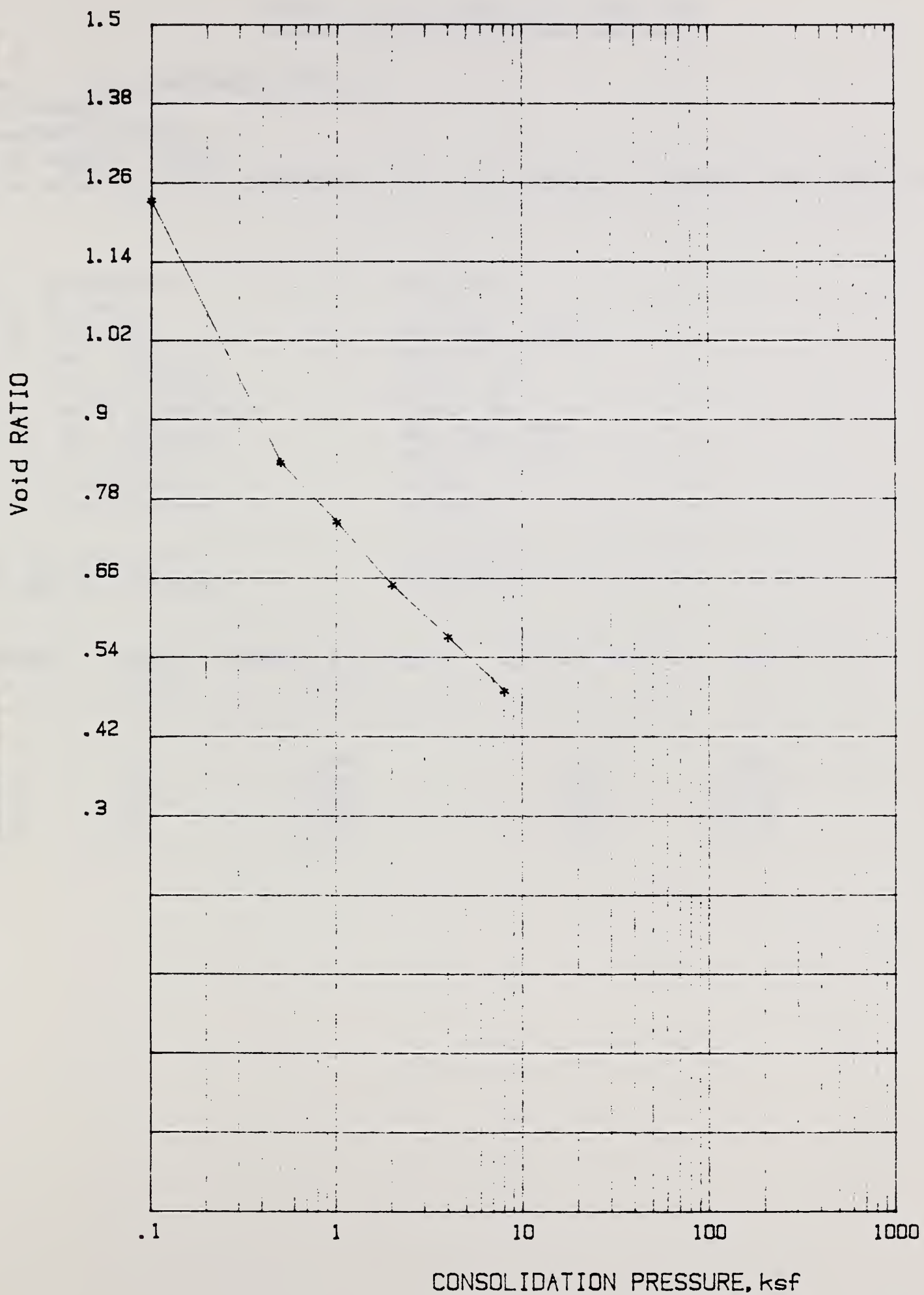
Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.







Project: WILLIAMS- McCLUSKY ND.

LAB. NUMBER 88C104

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



RESULTS OF CONSOLIDATION TEST  
=====

Project: WILLIAMS-McCLUSKY ND

Field number:

LAB.NUMBER 88C104

Sample depth: Feet

Sample description: COMPACTED TO 1.16 GMS/CC SATURATED AT START OF TEST

SAMPLE DIAMETER: 2.5 ins  
SAMPLE HEIGHT: 1 ins  
INITIAL VOLUME: 80.439 cm<sup>3</sup>  
INITIAL WET WEIGHT: 111.8 g  
INITIAL DRY WEIGHT: 93.3 g  
INITIAL WATER CONTENT: 19.8 %  
INITIAL WET DENSITY: 86.768 PCF  
INITIAL DRY DENSITY: 72.41 PCF  
SPECIFIC GRAVITY: 2.59  
INITIAL VOID RATIO: 1.233

FINAL WET WEIGHT: 117.42 g  
FINAL WATER CONTENT: 25.8 %

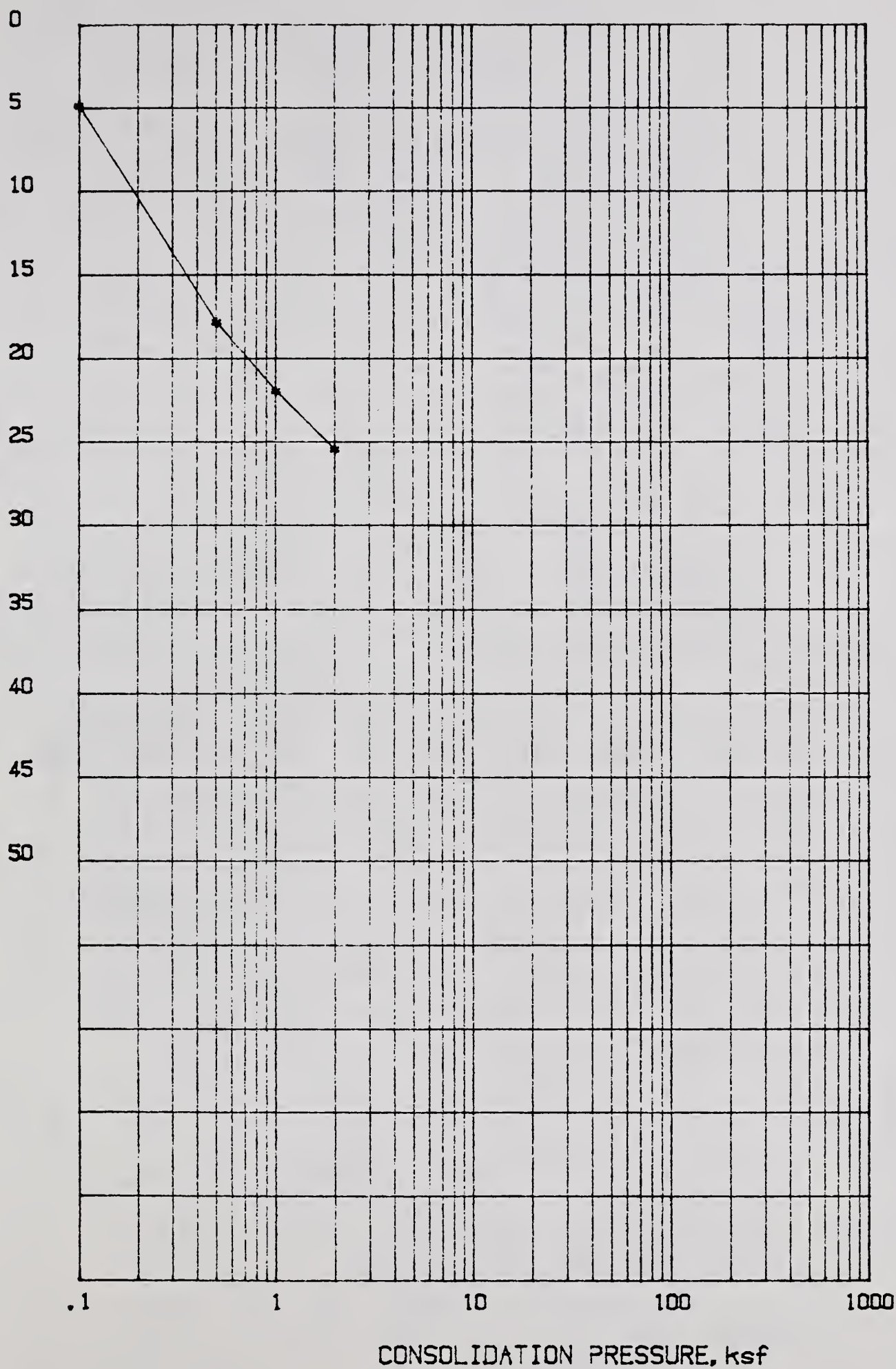
INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	.0486	1.1240	4.86
2.0	.50	.1785	.8340	17.85
3.0	1.00	.2198	.7420	21.98
4.0	2.00	.2551	.6630	25.51





Test 2

PERCENT CONSOLIDATION-LAB. SAMPLE.



Project: WILLIAMS-McCLUSKY ND

LAB. NUMBER 88C104

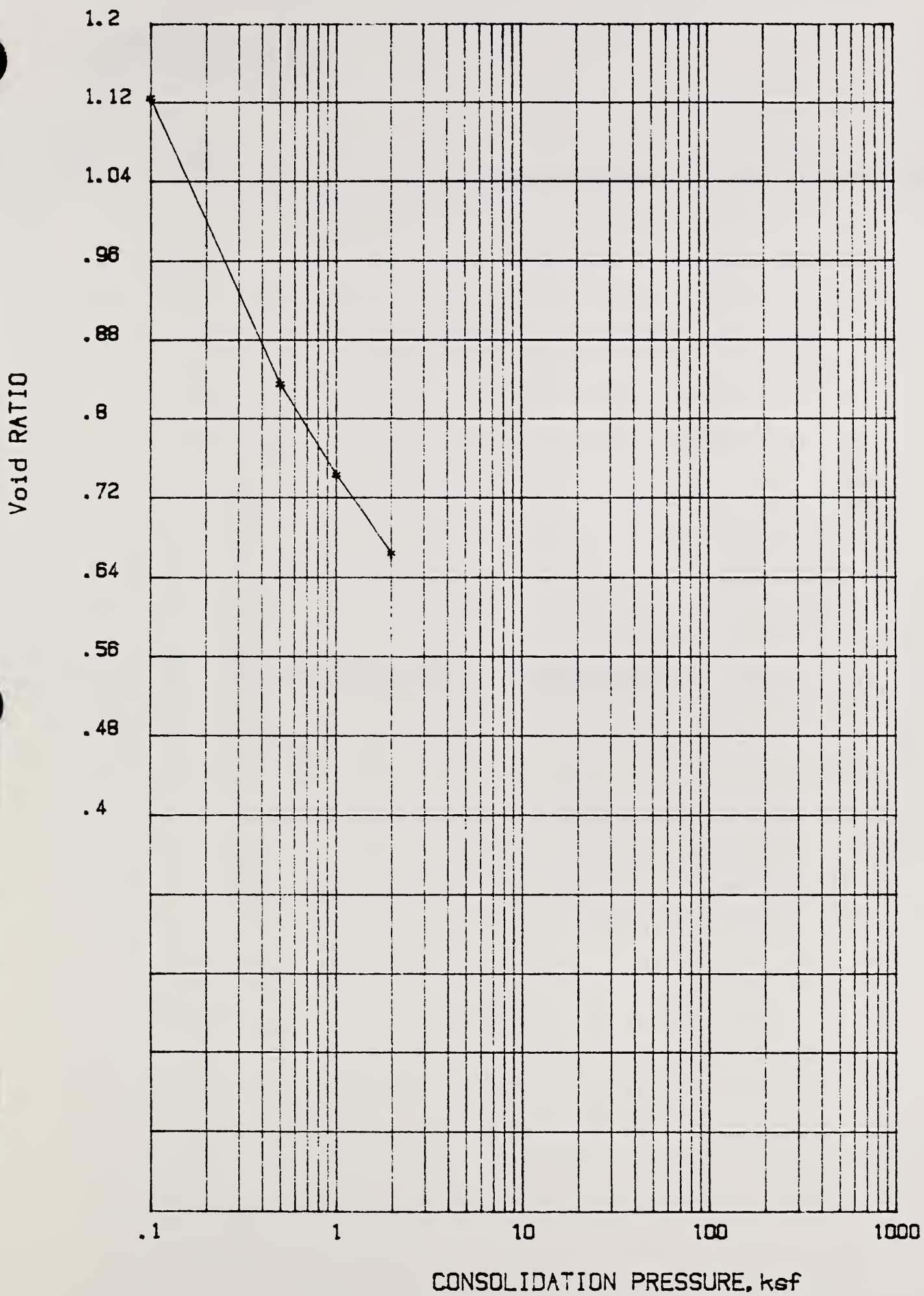
Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.



Test 2



Project: WILLIAMS-McCLUSKY ND

LAB. NUMBER 88C104

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.

7-10  
1-10  
9-10  
8-10  
7-10

# CONSOLIDATION TEST

=====

WEPP Sample

Project: WOODWARD-OKLAHOMA

Field number:

LAB. NUMBER 880105

Sample depth: Feet

Sample description: COMPACTED TO 1.41GMS/CC CL-ML LL=25 PI=7 SATURATED AT START OF TEST

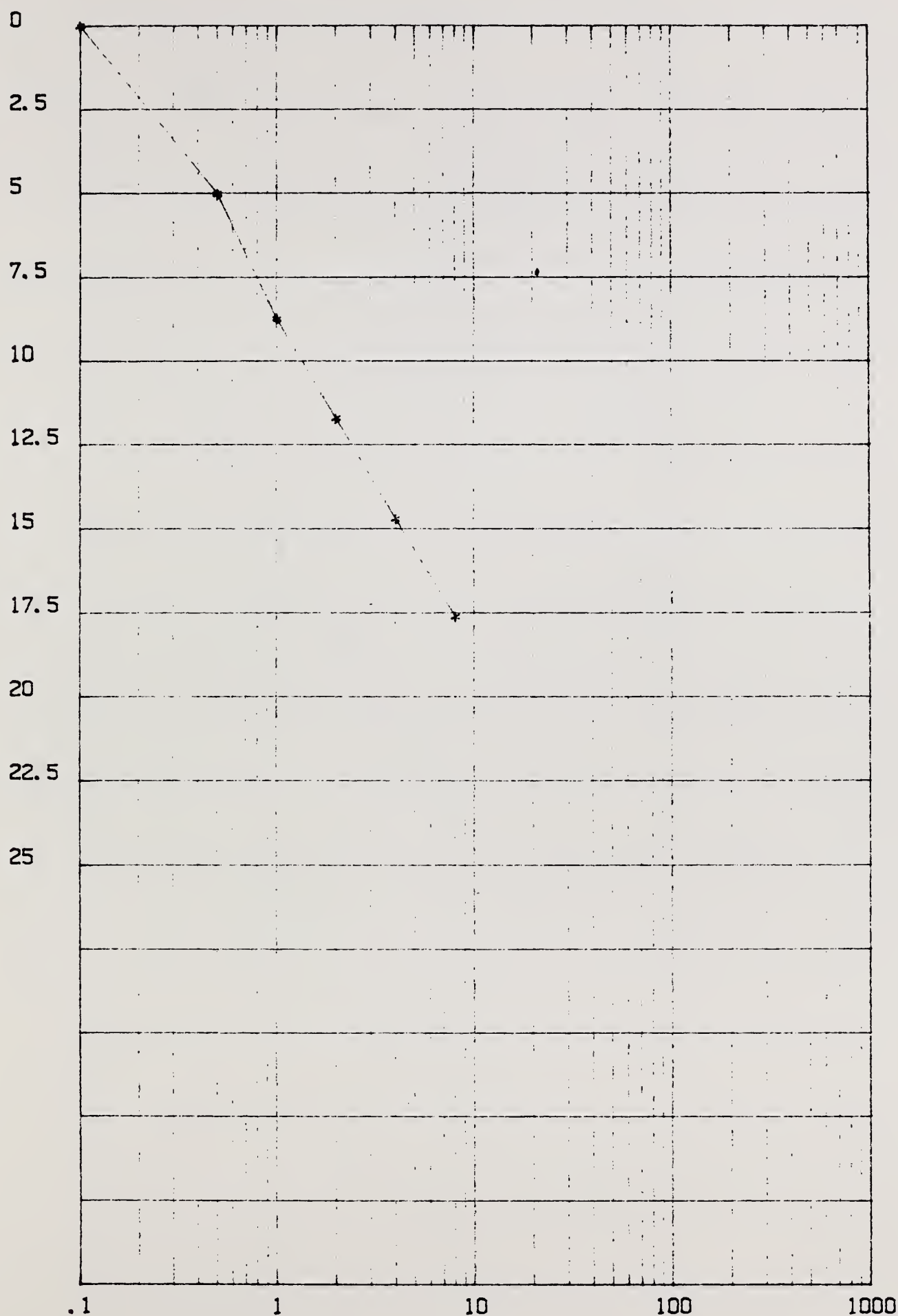
Initial height	2.5 ins
Final height	1 ins
Initial weight	80.439 gm
Final weight	122.92 g
Initial volume	1.34 cc
Final volume	1.34 cc
Initial density	60.00 g/cc
Final density	91.73 g/cc
Initial water content	25.00 %
Final water content	25.00 %
Initial saturation	100.00 %
Final saturation	100.00 %
Initial voids ratio	0.00
Final voids ratio	0.00
Initial porosity	0.00 %
Final porosity	0.00 %

INCREMENT	LOAD	CHANGE IN HEIGHT	VOIDS RATIO	Su%
			0.00	0.00
			0.03	5.03
			0.76	2.76
			11.74	11.74
			14.74	14.74
			17.65	17.65





PERCENT CONSOLIDATION-LAB. SAMPLE.



CONSOLIDATION PRESSURE, ksf

Project: WOODWARD-OKLAHOMA

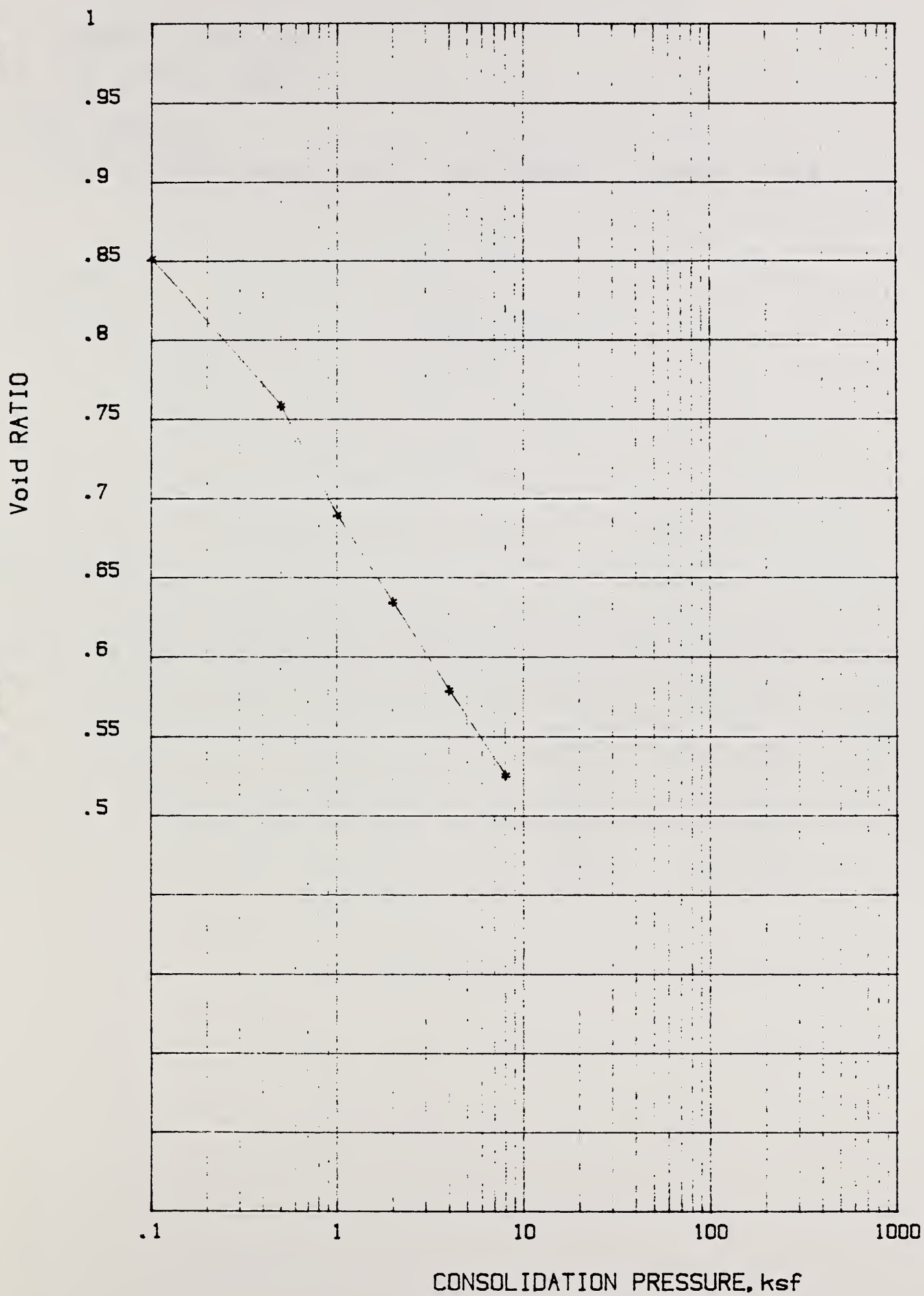
LAB. NUMBER 88C105

Field number:

Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.





Project: WOODWARD-OKLAHOMA

LAB. NUMBER 88C105

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.

P  
E  
L  
S  
S



# APPENDIX B: CONSOLIDATION TEST

WEPP Sample

Project: ZAHL-NORTH DAKOTA

Field number:

LAB. NUMBER 880106

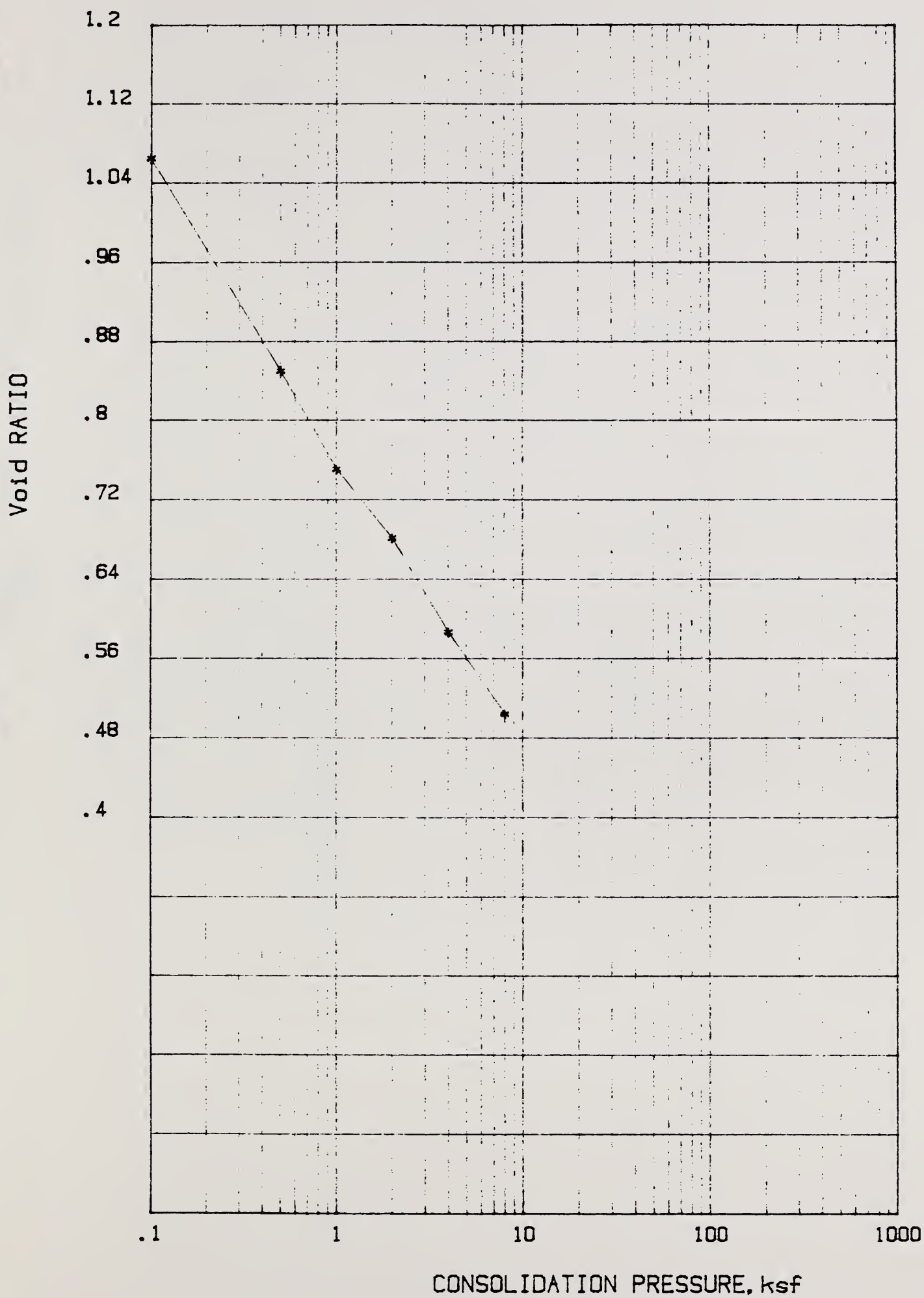
Sample depth: Feet

Sample description: COMPACTED TO 1.25 GMS/CC CL LL=31 PI=13

SAMPLE DIAMETER: 2.5 ins  
 SAMPLE HEIGHT: 1 ins  
 INITIAL VOLUME: 80.439 cm<sup>3</sup>  
 INITIAL WET WEIGHT: 108.02 g  
 INITIAL DRY WEIGHT: 100.53 g  
 INITIAL WET UNIT WEIGHT: 1.34 g/cc  
 INITIAL DRY UNIT WEIGHT: 1.25 g/cc  
 INITIAL VOID RATIO: 0.022  
 INITIAL SATURATION: 0%

INCREMENT	LOAD	CHANGE IN HEIGHT	VOIDS RATIO	Su%
			1.0640	0.00
			8490	10.43
			7490	15.24
			.6200	18.60
			5650	23.20
			.5020	27.22





Project: ZAHL-NORTH DAKOTA

LAB. NUMBER 88C106

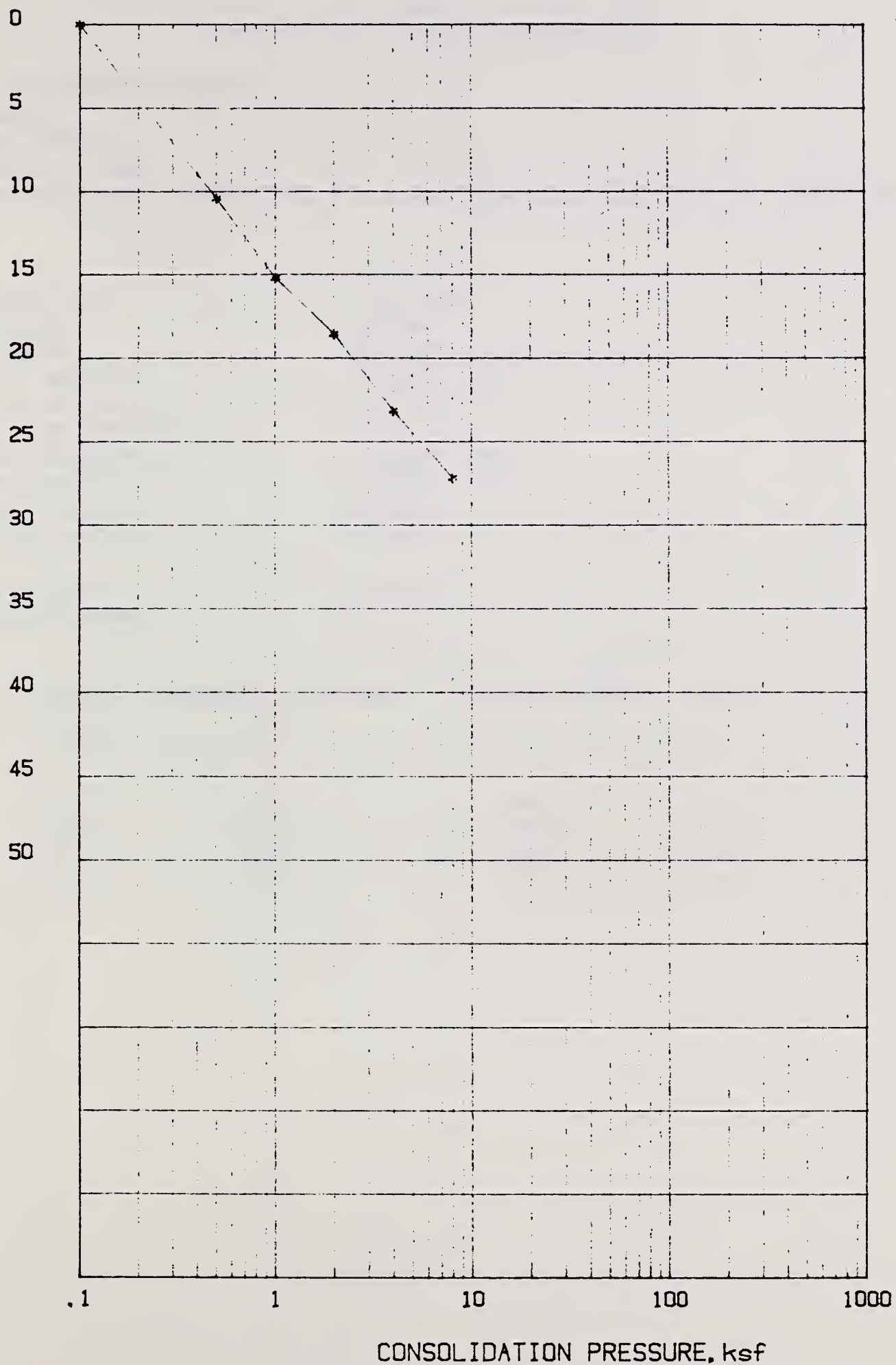
Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



PERCENT CONSOLIDATION-LAB. SAMPLE,



Project: ZAHL-NORTH DAKOTA

LAB. NUMBER 88C106

Field number:

Sample depth: Feet

USDA-SCS S.M.L. LINCOLN NE.



P  
P  
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P  
P

P  
P

P  
P

Test 2

RESULTS OF CONSOLIDATION TEST

=====

Project: ZAHL-NORTH DAKOTA

Field number:

LAB.NUMBER 88C106

Sample depth: Feet

Sample description: COMPACTED TO 1.25 GMS/CC SATURATED AT START OF TEST

SAMPLE DIAMETER: 2.5 ins  
SAMPLE HEIGHT: 1 ins  
INITIAL VOLUME: 80.439 cm<sup>3</sup>  
INITIAL WET WEIGHT: 117.23 g  
INITIAL DRY WEIGHT: 100.54 g  
INITIAL WATER CONTENT: 16.6 %  
INITIAL WET DENSITY: 90.983 PCF  
INITIAL DRY DENSITY: 78.029 PCF  
SPECIFIC GRAVITY: 2.58  
INITIAL VOID RATIO: 1.064

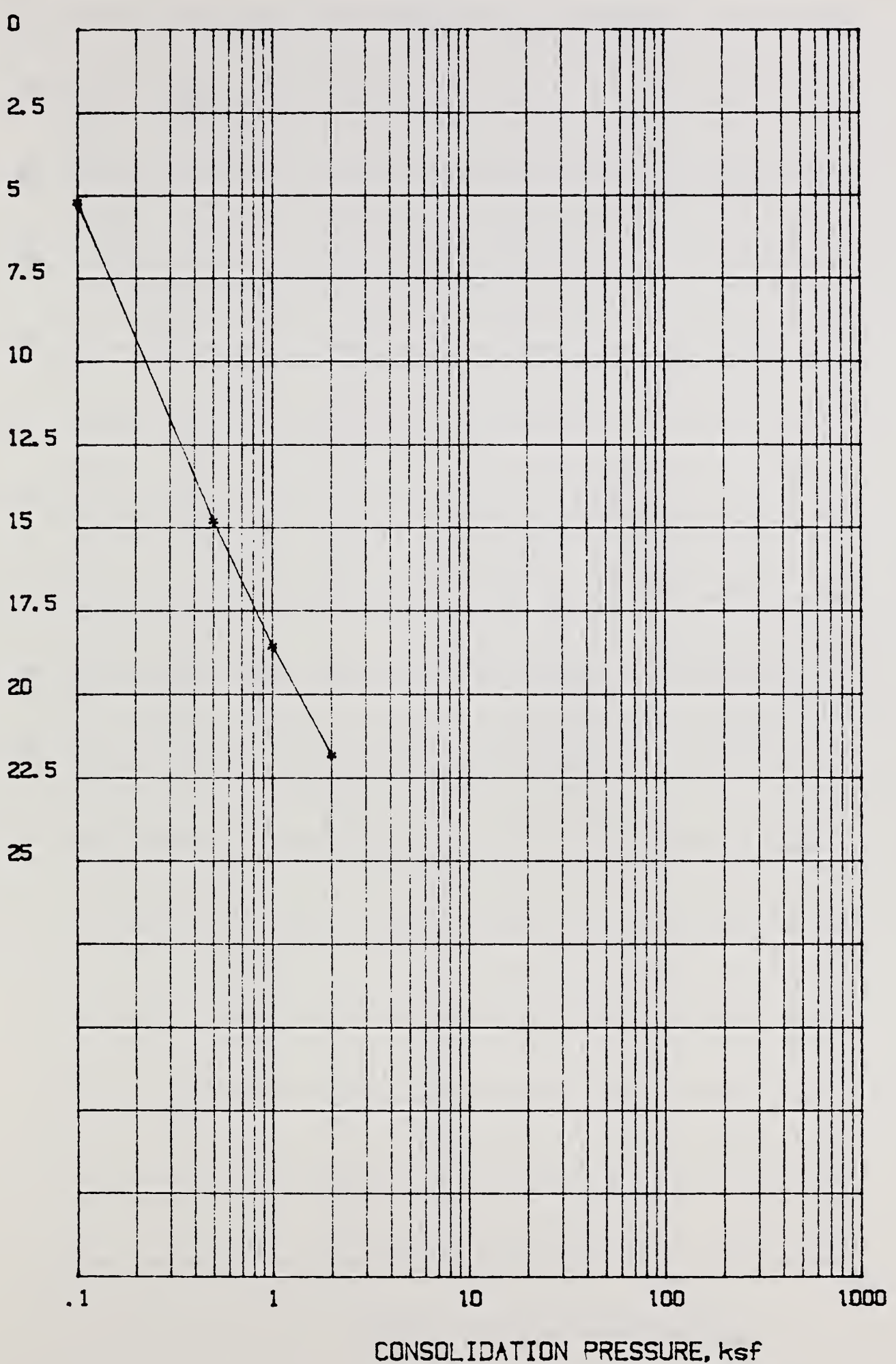
FINAL WET WEIGHT: 123.67 g  
FINAL WATER CONTENT: 23 %

INCREMENT	LOAD ( ksf )	CHANGE IN HEIGHT (ins)	VOIDS RATIO	Su%
1.0	.10	.0520	.9560	5.20
2.0	.50	.1482	.7580	14.82
3.0	1.00	.1860	.6800	18.60
4.0	2.00	.2186	.6120	21.86



Test 2

PERCENT CONSOLIDATION-LAB. SAMPLE.



CONSOLIDATION PRESSURE, ksf

Project: ZAHL-NORTH DAKOTA

LAB. NUMBER 88C106

Field number:

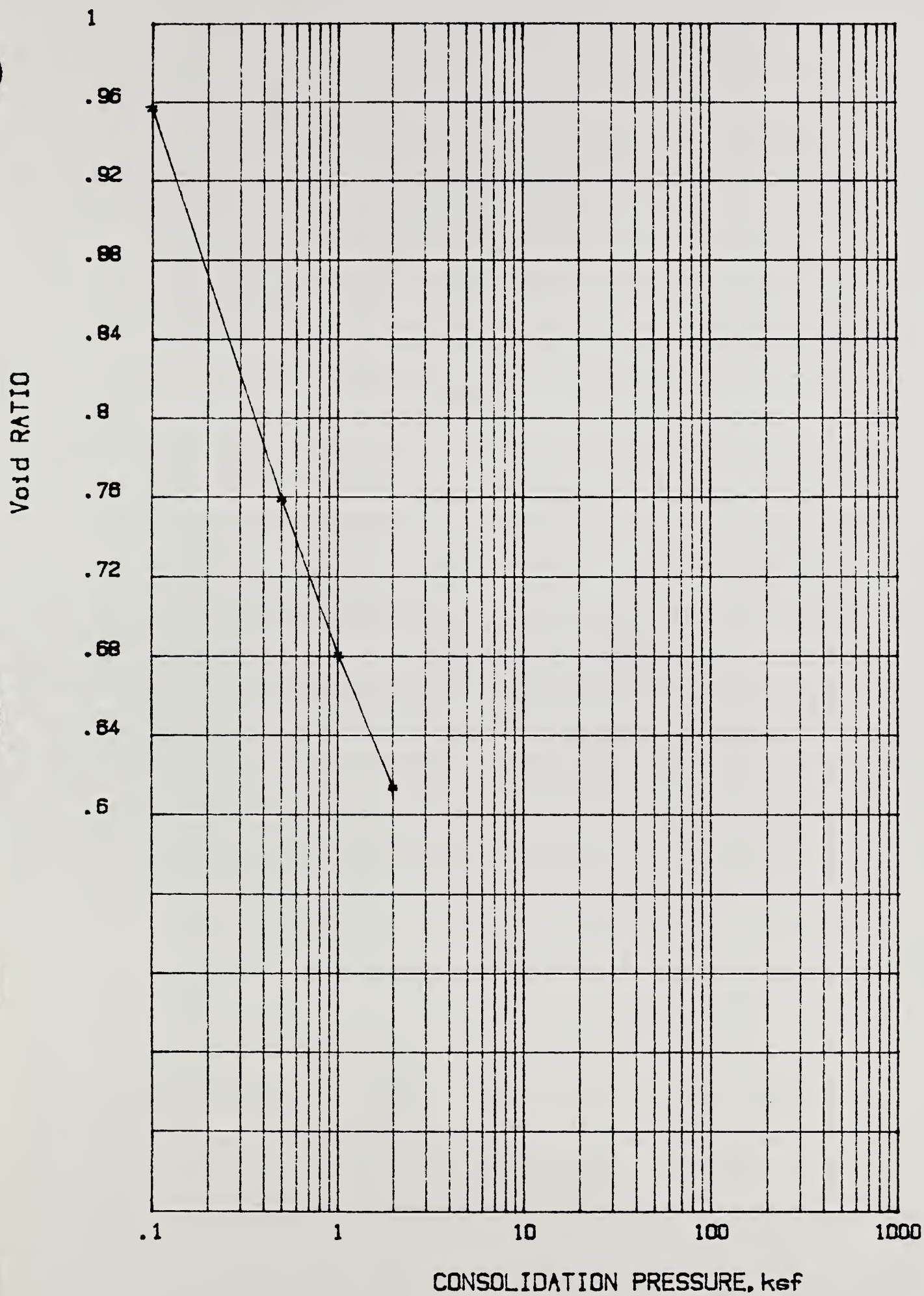
Sample depth: Feet

USDA-SCS S. M. L. LINCOLN NE.





Test 2



Project: ZAHL-NORTH DAKOTA

LAB. NUMBER 88C106

Field number:

Sample depth: Feet

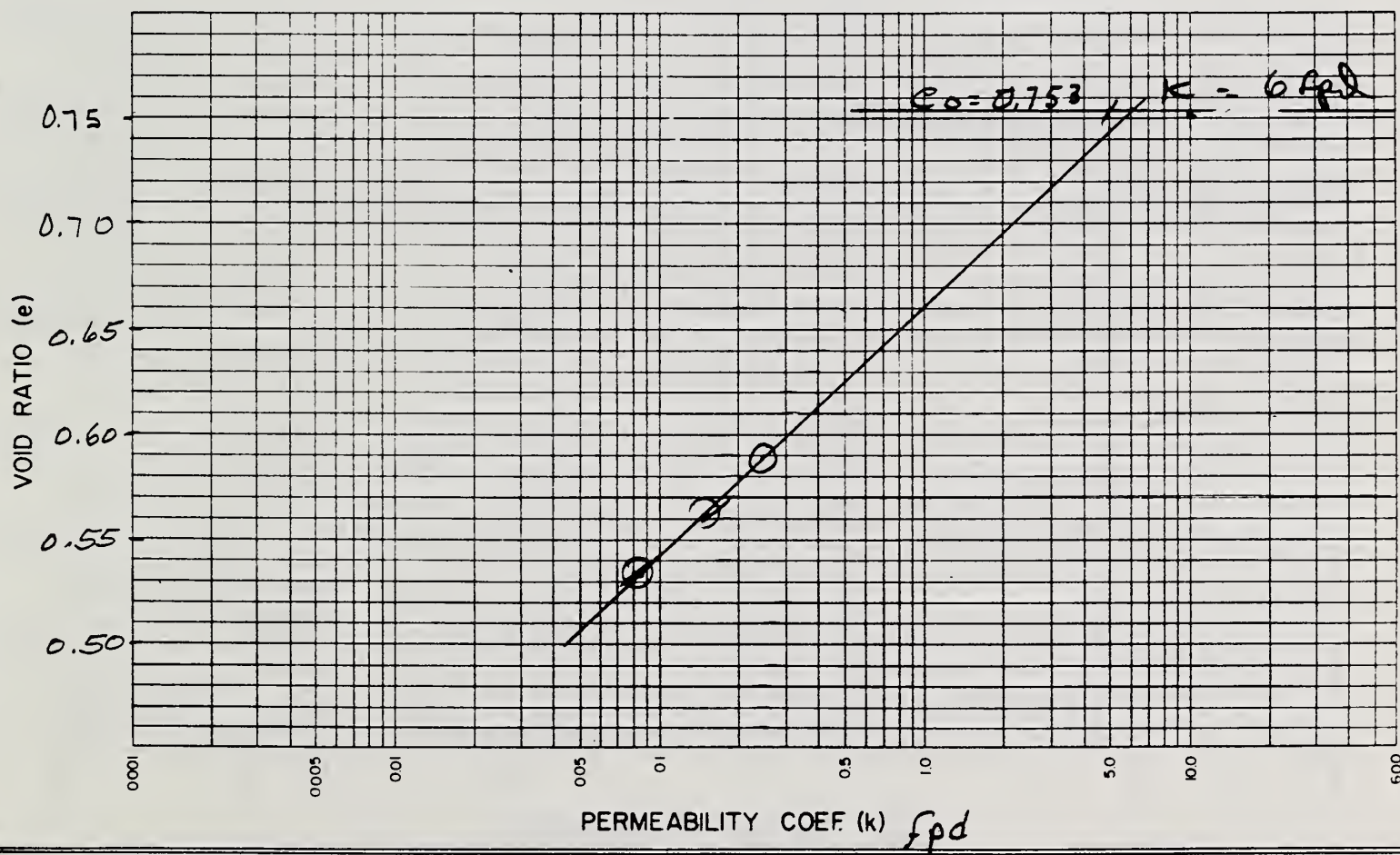
USDA-SCS S. M. L. LINCOLN NE.



Permeability Data



<b>MATERIALS TESTING REPORT</b>		<b>U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE</b>		<b>SOIL PERMEABILITY</b>	
PROJECT and STATE <u>ABILENE - TEXAS</u>				SAMPLE LOCATION	
FIELD SAMPLE NO		DEPTH		GEOLOGIC ORIGIN	
TYPE OF SAMPLE <u>Compacted</u>		TESTED AT <u>SML, Lincoln</u>		APPROVED BY	
CLASSIFICATION <u>Non-Plastic SM LL ___ PI ___</u>		SPECIFIC GRAVITY			
TEST NO.		<u>2000</u>	<u>4030</u>	<u>8030</u>	<u>4</u>
INITIAL MOISTURE %					
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf		<u>1.65</u>	<u>1.69</u>	<u>1.71</u>	
VOID RATIO		<u>.5898</u>	<u>.5608</u>	<u>.5347</u>	
PERMEABILITY COEF. <u>FPD</u>		<u>.25018</u>	<u>.16597</u>	<u>.08778</u>	
PERCOLATION COEF					
$H/L$ DURING TEST					
TEST SPECIFICATIONS <u>Falling Head Perm.</u>					



## REMARKS

$$e_0 = 0.753$$

$$\text{Volume Change} = 12.5\%$$

$$K \text{ at } e_0 = 15 \text{ fpd}$$





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE <i>WEPP - Academy - Fresno CA</i>			SAMPLE LOCATION		
FIELD SAMPLE NO		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE <i>Remold</i>		TESTED AT <i>SML - Lincoln</i>	APPROVED BY		DATE
CLASSIFICATION <i>Non-plastic SM LL PI</i>				SPECIFIC GRAVITY	
TEST NO	<i>2000</i>	<i>4000</i>	<i>8000</i>	<i>4</i>	$G_s (-)^{\#4}$ <i>2.75</i>
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf					$G_m (Bulk)(+)^{\#4}$
VOID RATIO	<i>.4947</i>	<i>.4571</i>	<i>.4217</i>		TEST SPECIFICATIONS <i>Falling Head Perms</i>
PERMEABILITY COEF <i>F.P.D.</i>	<i>.02646</i>	<i>.01458</i>	<i>.00878</i>		
PERCOLATION COEF					
$H/L$ DURING TEST					

$e_0 = 0.716$   $k = 0.8 f_{pd}$

Permeability Coef (k)	Void Ratio (e)
0.002	0.42
0.003	0.45
0.005	0.49
0.008	0.52

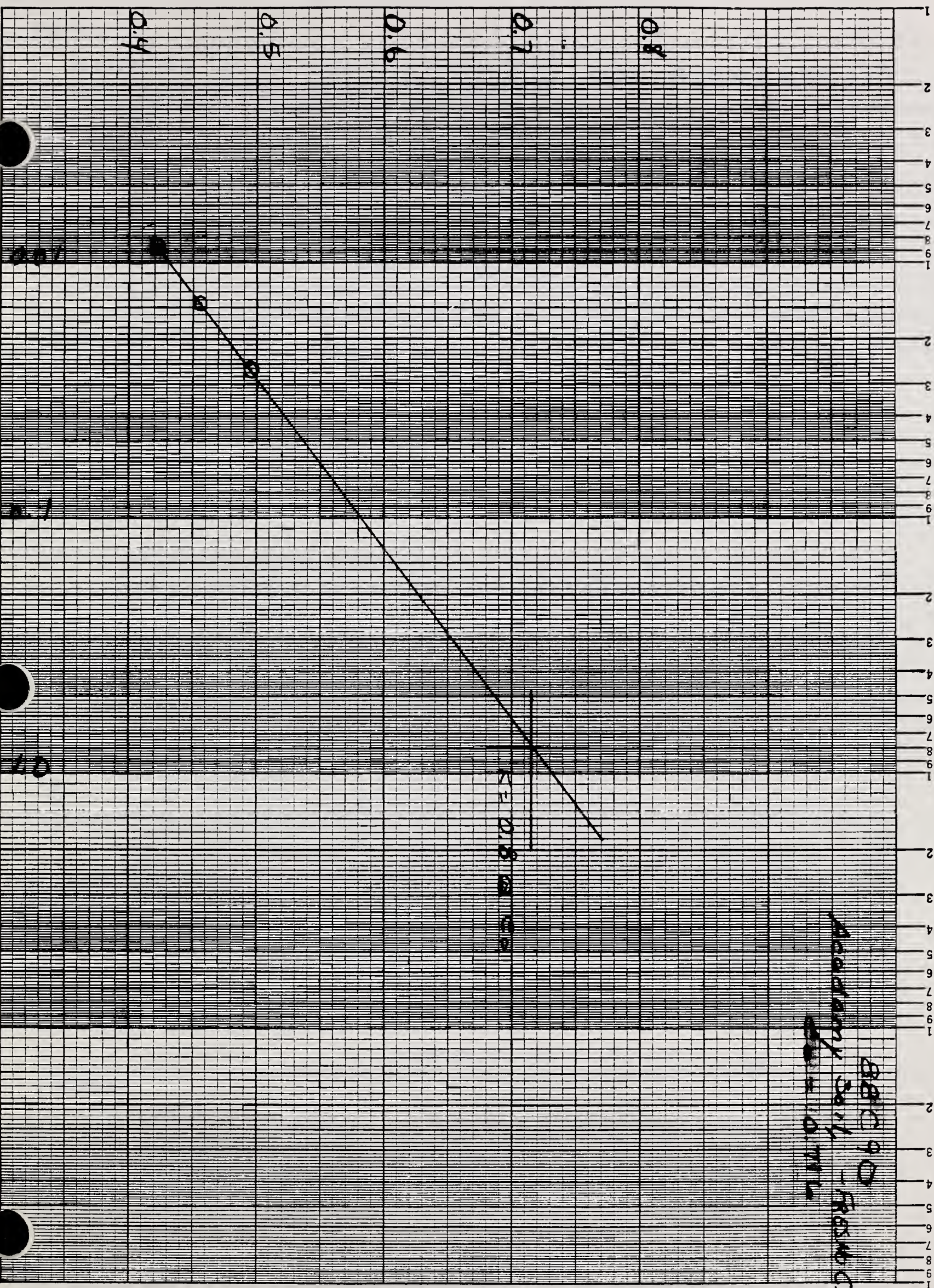
REMARKS
$e_0 = 0.716$
Volume Change = 17.2%
at $e_0 = 0.8 f_{pd}$





BBIC 90  
Academy Soil - RESMICA  
4.5 - 10.714

K = 0.8



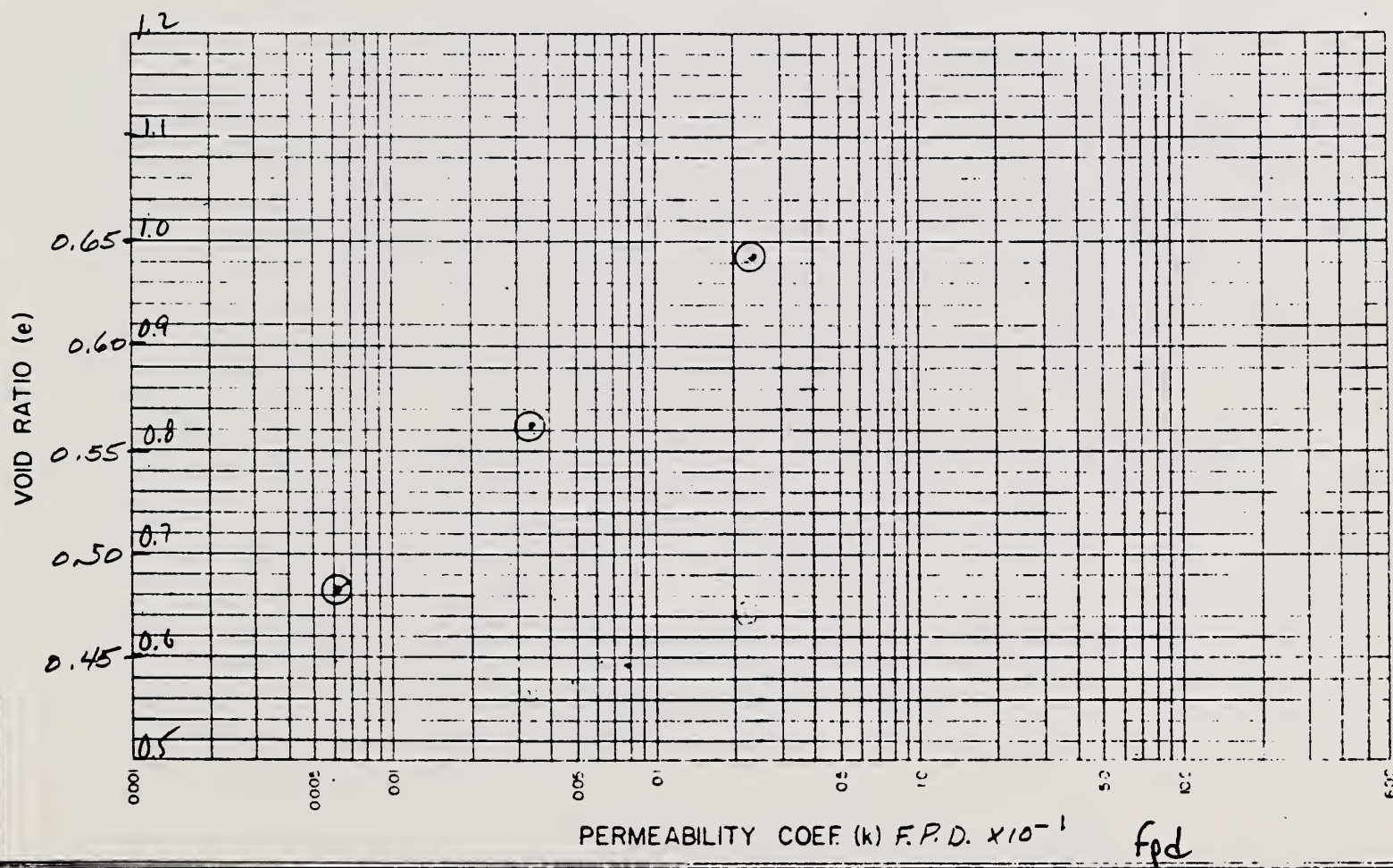
Permeability Coef., K (Gpd)







MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE <i>WEPP Barnes - Morris MN.</i>			SAMPLE LOCATION		
FIELD SAMPLE NO.		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE <i>Remold</i>		TESTED AT <i>SML, Lincoln</i>	APPROVED BY		DATE
CLASSIFICATION <i>CL LL 26 PI 9</i>				SPECIFIC GRAVITY	
TEST NO		<i>2000</i>	<i>4000</i>	<i>8000</i>	<i>4</i>
INITIAL MOISTURE %					
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf					
VOID RATIO		<i>.6401</i>	<i>.5621</i>	<i>.4832</i>	
PERMEABILITY COEF F.P.D.		<i>.02300</i>	<i>.00349</i>	<i>.00061</i>	
PERCOLATION COEF					
$H/L$ DURING TEST					
TEST SPECIFICATIONS <i>Falling Head Perm</i>					

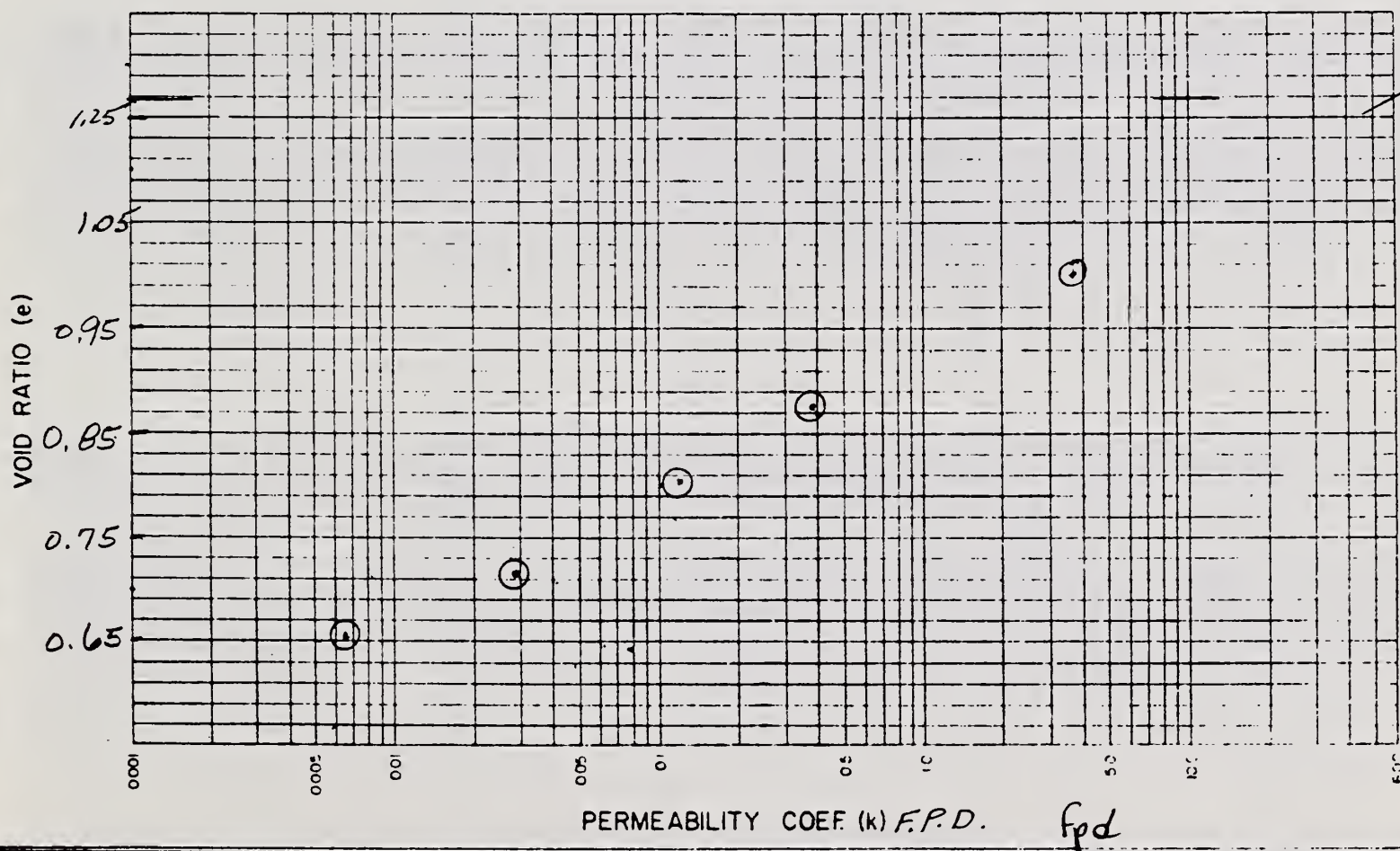


REMARKS

$$e_0 = 1.273$$



MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE Wepp - Barnes Soil Morris MN			SAMPLE LOCATION		
FIELD SAMPLE NO		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE Compacted		TESTED AT SML, Lincoln	APPROVED BY		DATE
CLASSIFICATION CL LL 26 PI 9				SPECIFIC GRAVITY	
TEST NO	100	230	500	1000	2000
INITIAL MOISTURE %					$G_s (+)^4$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	1.30	1.39	1.44	1.51	$\rho_s (+)^4$
VOID RATIO	1.0050	.8788	.8085	.7284	.6533
PERMEABILITY COEF F.P.D.	1.3900	.39238	.12577	.02924	.00665
PERCOLATION COEF					
$H/L$ DURING TEST					

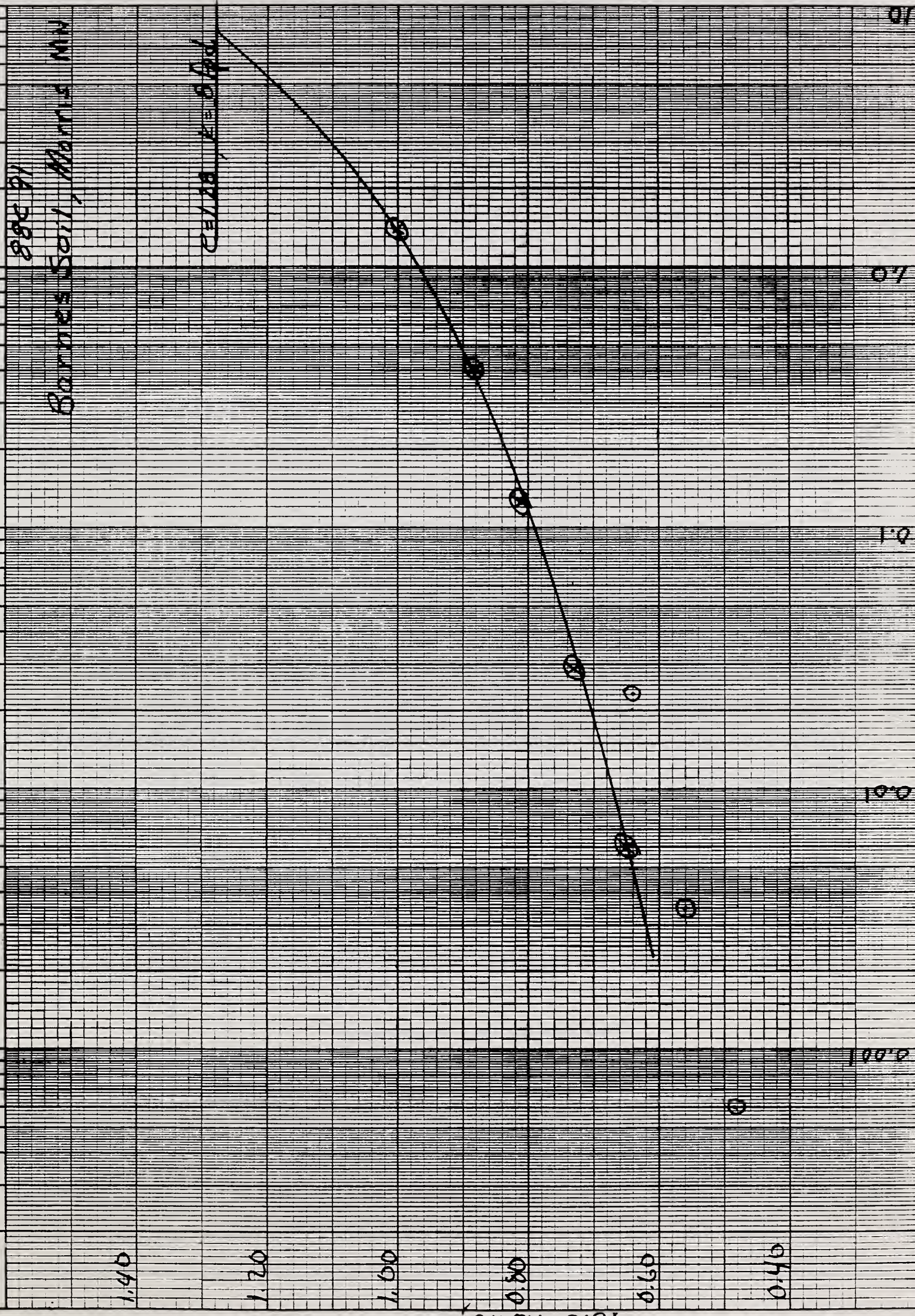


REMARKS

 $e = 1.289$











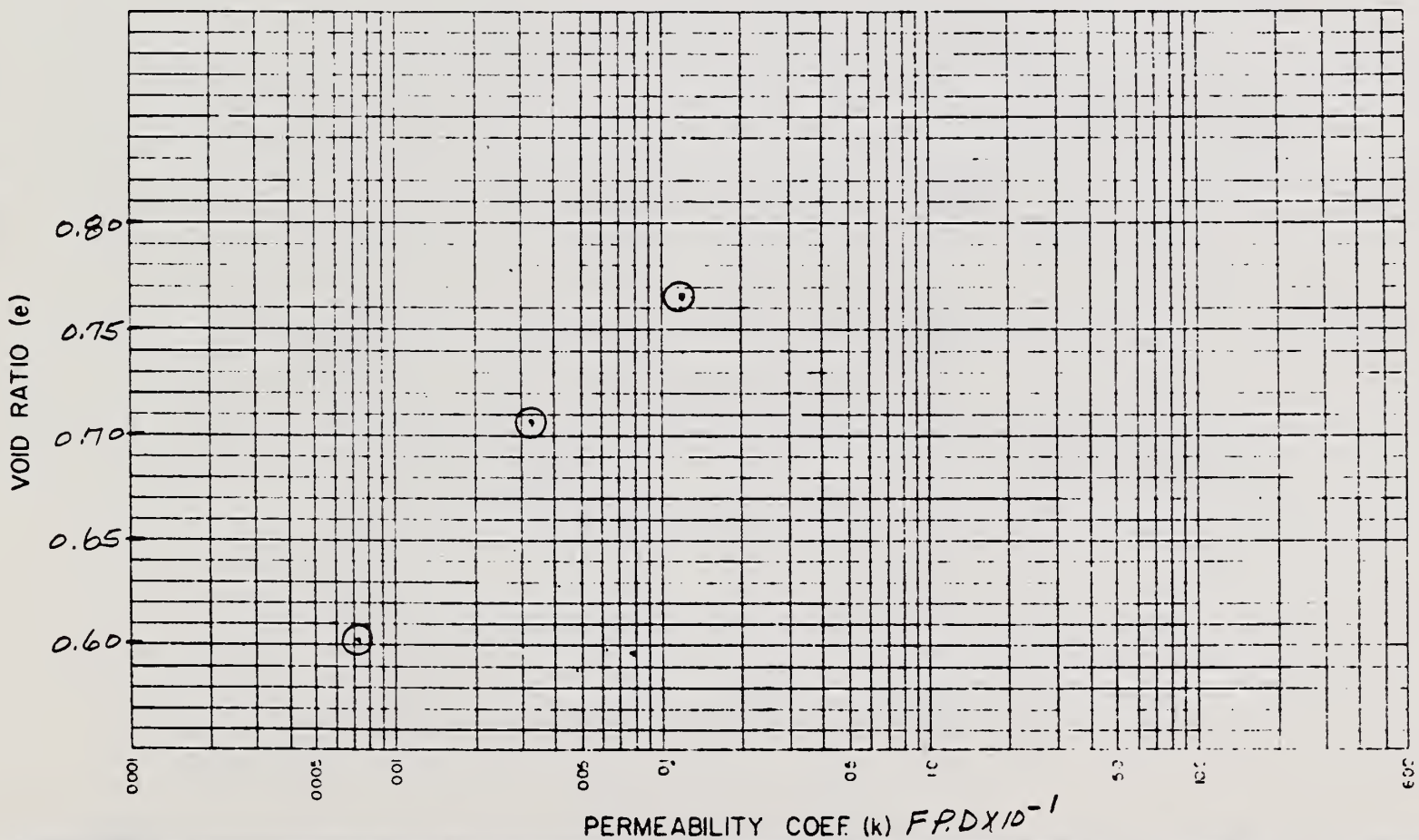
Test 1

SCS-ENG-127  
REV. 1-72

LABORATORY NO. B8C 92

<b>MATERIALS TESTING REPORT</b>	<b>U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE</b>	<b>SOIL PERMEABILITY</b>
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PROJECT and STATE <i>WEPP Barnes McClusky ND.</i>					SAMPLE LOCATION	
FIELD SAMPLE NO	DEPTH	GEOLOGIC ORIGIN				
TYPE OF SAMPLE <i>Remolded</i>	TESTED AT <i>SML, Lincoln</i>	APPROVED BY				DATE
CLASSIFICATION <div style="text-align: right; margin-right: 50px;">LL ____ PI ____</div>					SPECIFIC GRAVITY	
TEST NO	<i>2000</i>	<i>4000</i>	<i>8000</i>	<i>4</i>	$G_s (-)^{\#4}$	<i>2.55</i>
INITIAL MOISTURE %					$G_s (+)^{\#4}$	
DRY DENSITY <div style="font-size: small;">□ g/cc □ pcf</div>	<i>1.44</i>	<i>1.49</i>	<i>1.59</i>		$G_m (Bulk)(+)^{\#4}$	
VOID RATIO	<i>.7652</i>	<i>.7086</i>	<i>.6012</i>		TEST SPECIFICATIONS <i>Falling Head Perm.</i>	
PERMEABILITY COEF <i>F.P.D.</i>	<i>.01224</i>	<i>.00330</i>	<i>.00073</i>			
PERCOLATION COEF						
$H/L$ DURING TEST						

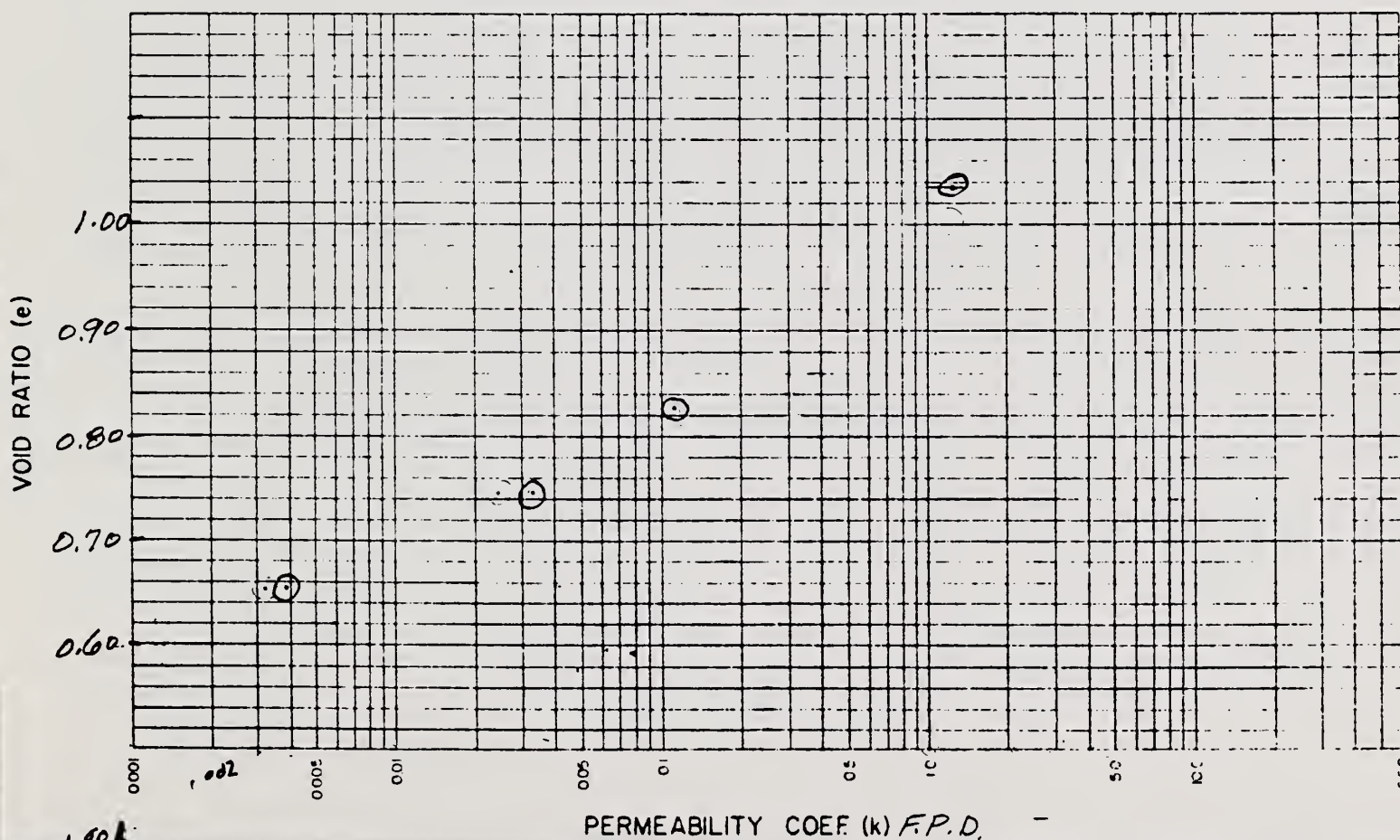


REMARKS

$$e_0 = 1.121$$



MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE <i>We PP BARNES - McClusky, N.D.</i>			SAMPLE LOCATION		
FIELD SAMPLE NO.		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE <i>Compacted</i>		TESTED AT <i>SML, Lincoln</i>	APPROVED BY		DATE
CLASSIFICATION <i>CL LL 31 PI 12</i>				SPECIFIC GRAVITY	
TEST NO.	<i>101</i>	<i>500</i>	<i>1000</i>	<i>2000</i>	$G_s (-)^{\#4}$ <i>2.55</i>
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	<i>1.25</i>	<i>1.40</i>	<i>1.46</i>	<i>1.54</i>	$G_m (Bulk)(+)^{\#4}$
VOID RATIO	<i>1.0347</i>	<i>.8275</i>	<i>.7449</i>	<i>.6554</i>	TEST SPECIFICATIONS <i>FALLING HEAD PERM.</i>
PERMEABILITY COEF. F.P.D.	<i>1.3362</i>	<i>.12863</i>	<i>.03330</i>	<i>.00394</i>	
PERCOLATION COEF					
$H/L$ DURING TEST					



REMARKS

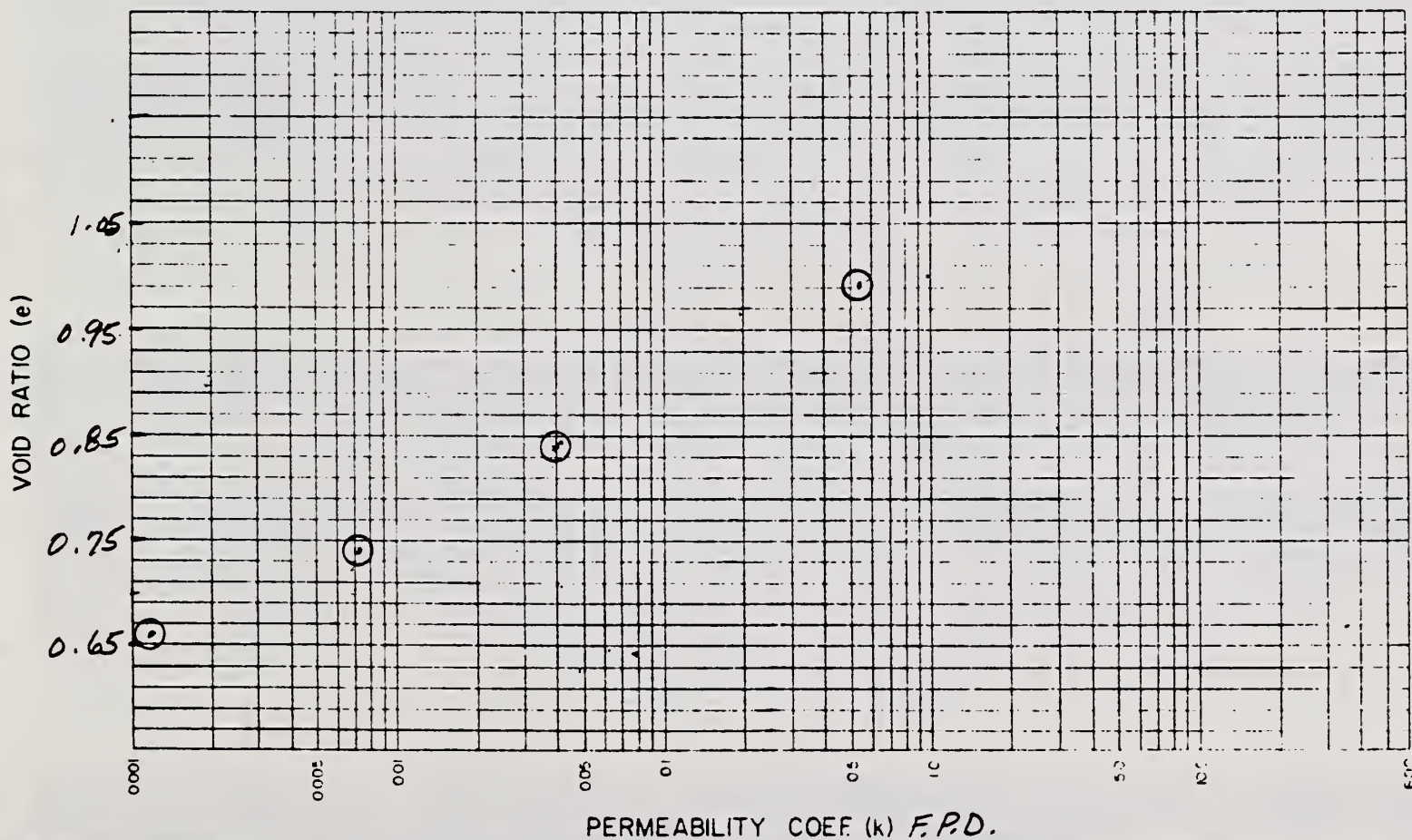
$$e_0 = 1.125$$







MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE <i>We PP - Barnes - McClusky, ND.</i>				SAMPLE LOCATION	
FIELD SAMPLE NO		DEPTH		GEOLOGIC ORIGIN	
TYPE OF SAMPLE <i>Compacted</i>		TESTED AT <i>SML - Lincoln</i>		APPROVED BY	
DATE					
CLASSIFICATION <i>CL LL 31 PI 12</i>				SPECIFIC GRAVITY	
TEST NO.	<i>100</i>	<i>580</i>	<i>1080</i>	<i>2080</i>	$G_s (-)^{\#4}$
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY $\square$ g/cc $\square$ pcf	<i>1.28</i>	<i>1.38</i>	<i>1.46</i>	<i>1.53</i>	$G_{m(Bulk)}(+)^{\#4}$
VOID RATIO	<i>.9928</i>	<i>.8445</i>	<i>.7427</i>	<i>.6643</i>	TEST SPECIFICATIONS <i>Falling Head Perm.</i>
PERMEABILITY COEF <i>F.P.D.</i>	<i>.53575</i>	<i>.04086</i>	<i>.00726</i>	<i>.00125</i>	
PERCOLATION COEF					
$H/L$ DURING TEST					



REMARKS

$e_0 = 1.125$

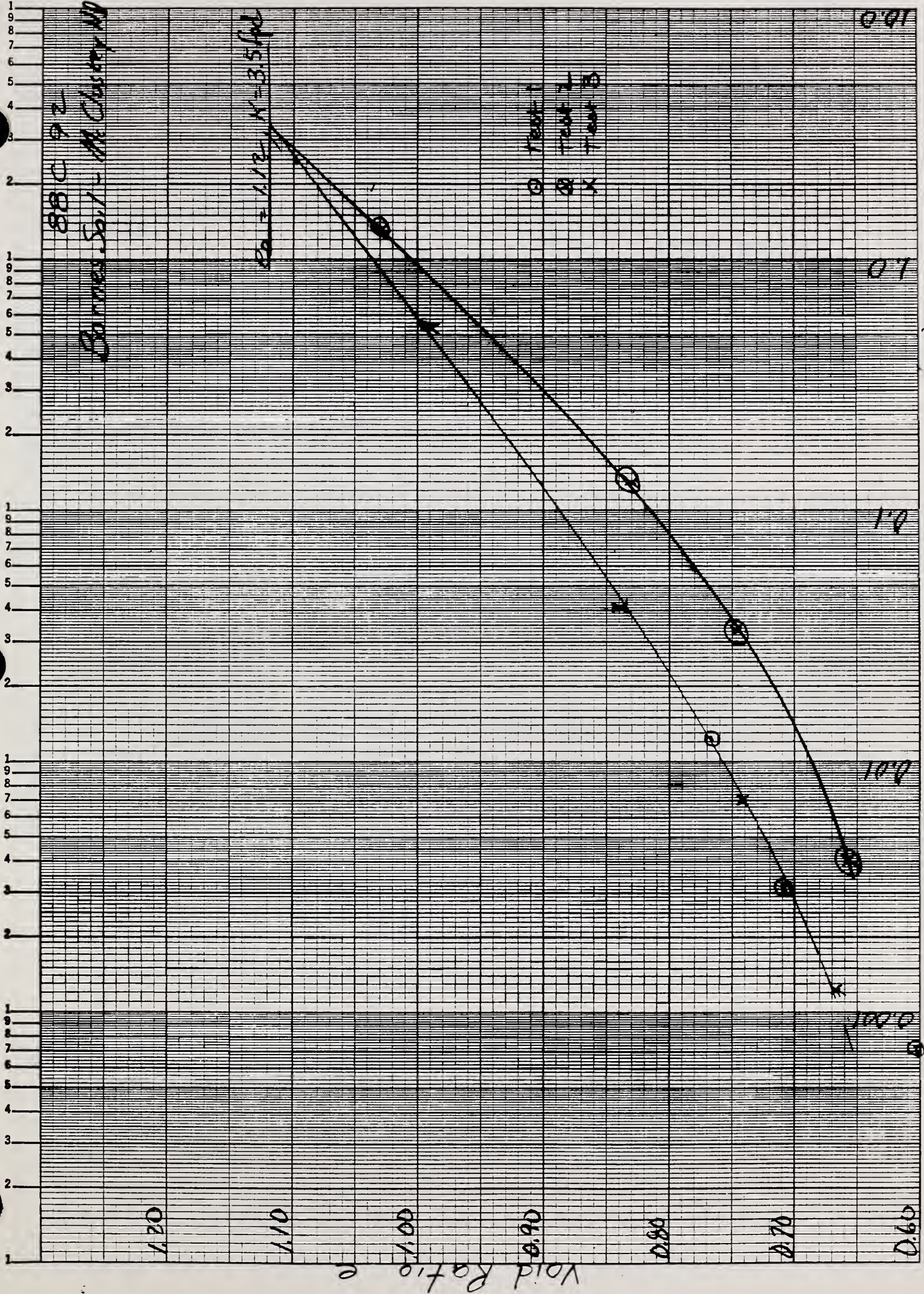




88 C 92  
Barnes Sp. 1 - Mc Cluskey Rd

$P_a = 112 \text{ psi}$   $K = 3.5 \text{ fpd}$

Test 1  
Test 2  
Test 3



Permeability Coef. K (fpd)





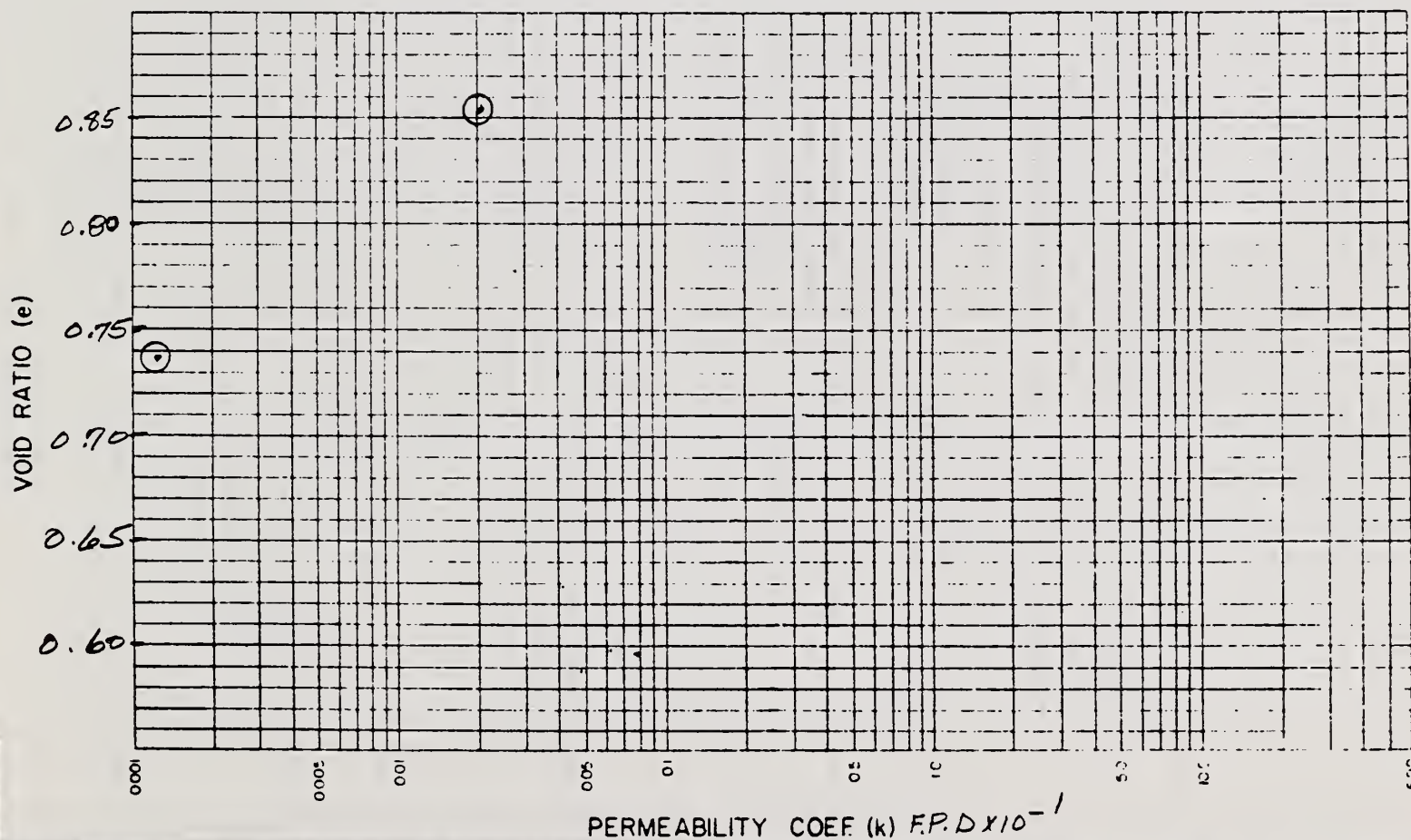
Test 1

88C 93

SCS-ENG-127  
REV. 1-72

LABORATORY NO.

MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE WEPP HEIDEN WACO TX			SAMPLE LOCATION		
FIELD SAMPLE NO		DEPTH		GEOLOGIC ORIGIN	
TYPE OF SAMPLE		TESTED AT SML, Lincoln		APPROVED BY	
DATE					
CLASSIFICATION				SPECIFIC GRAVITY	
LL ____ PI ____					
TEST NO		2000 4000 8000		4	
INITIAL MOISTURE %				G <sub>s</sub> (-) #4	
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf		1.44 1.54 1.63		G <sub>s</sub> (+) #4	
VOID RATIO		.8523 .7378 .6411		G <sub>m</sub> (Bulk)(+) #4	
PERMEABILITY COEF F.P.D.		.00216 .00012 .00000		TEST SPECIFICATIONS	
PERCOLATION COEF				Falling Head Perm.	
H <sub>L</sub> DURING TEST					



REMARKS

$$e_0 = 1.693$$



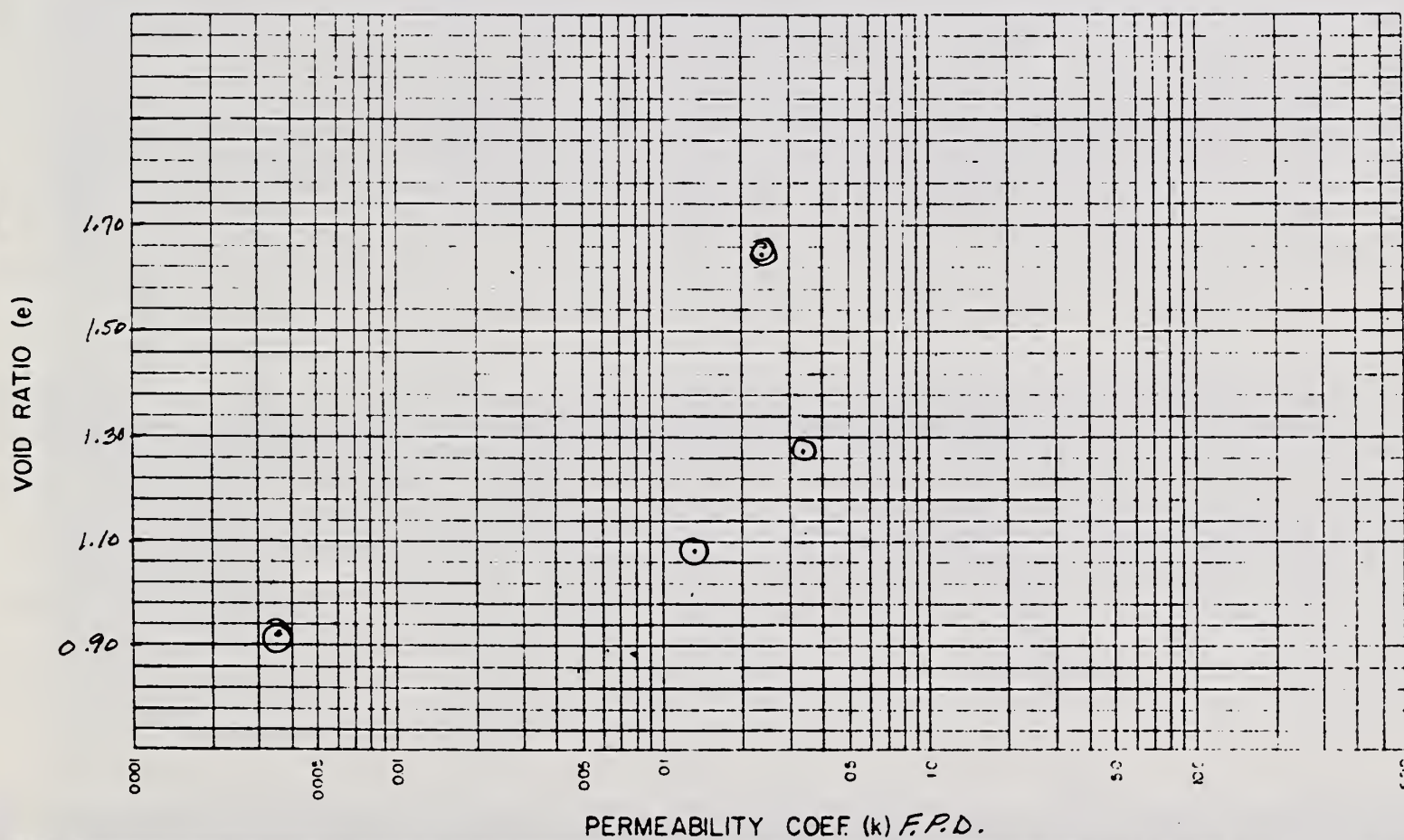


Test 2

SCS-ENG-127  
REV. 1-72

FORM NO. 1 88C 93

MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE Wepp- Heiden - Waco, TX.				SAMPLE LOCATION	
FIELD SAMPLE NO.		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE Compacted		TESTED AT SML, Lincoln	APPROVED BY		DATE
CLASSIFICATION CH LL 52 PI 37				SPECIFIC GRAVITY	
TEST NO	100	500	1000	2000	G <sub>s</sub> (-) #4
INITIAL MOISTURE %					G <sub>s</sub> (+) #4
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	1.01	1.18	1.28	1.39	G <sub>m</sub> (Bulk)(+) #4
VOID RATIO	1.6444	1.2679	1.0826	.9275	TEST SPECIFICATIONS Falling Head Perm
PERMEABILITY COEF. F.P.D.	2.4032	3.4354	14607	.00366	
PERCOLATION COEF					
H <sub>1</sub> /L DURING TEST					

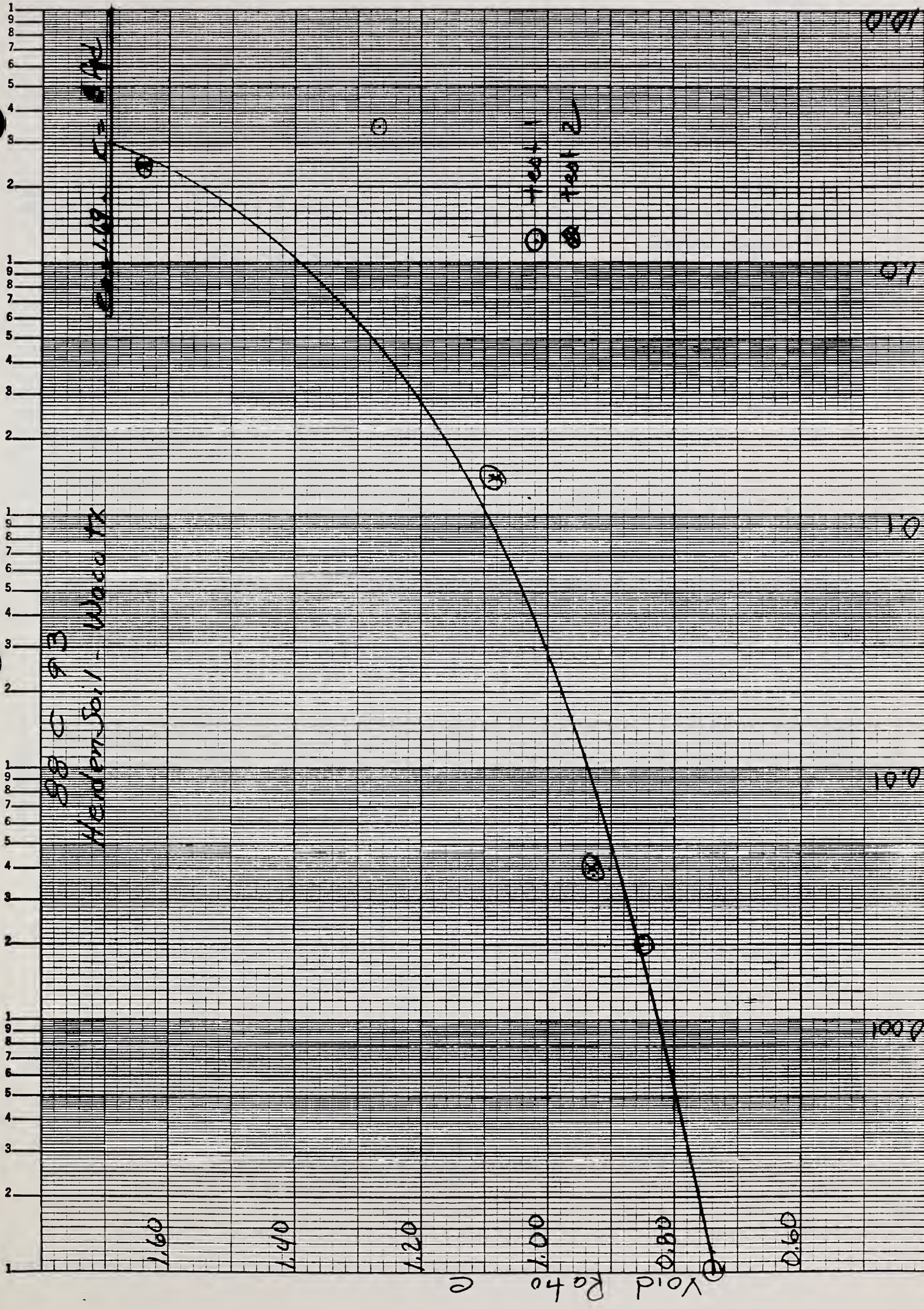


REMARKS

$$e_0 = 1.697$$





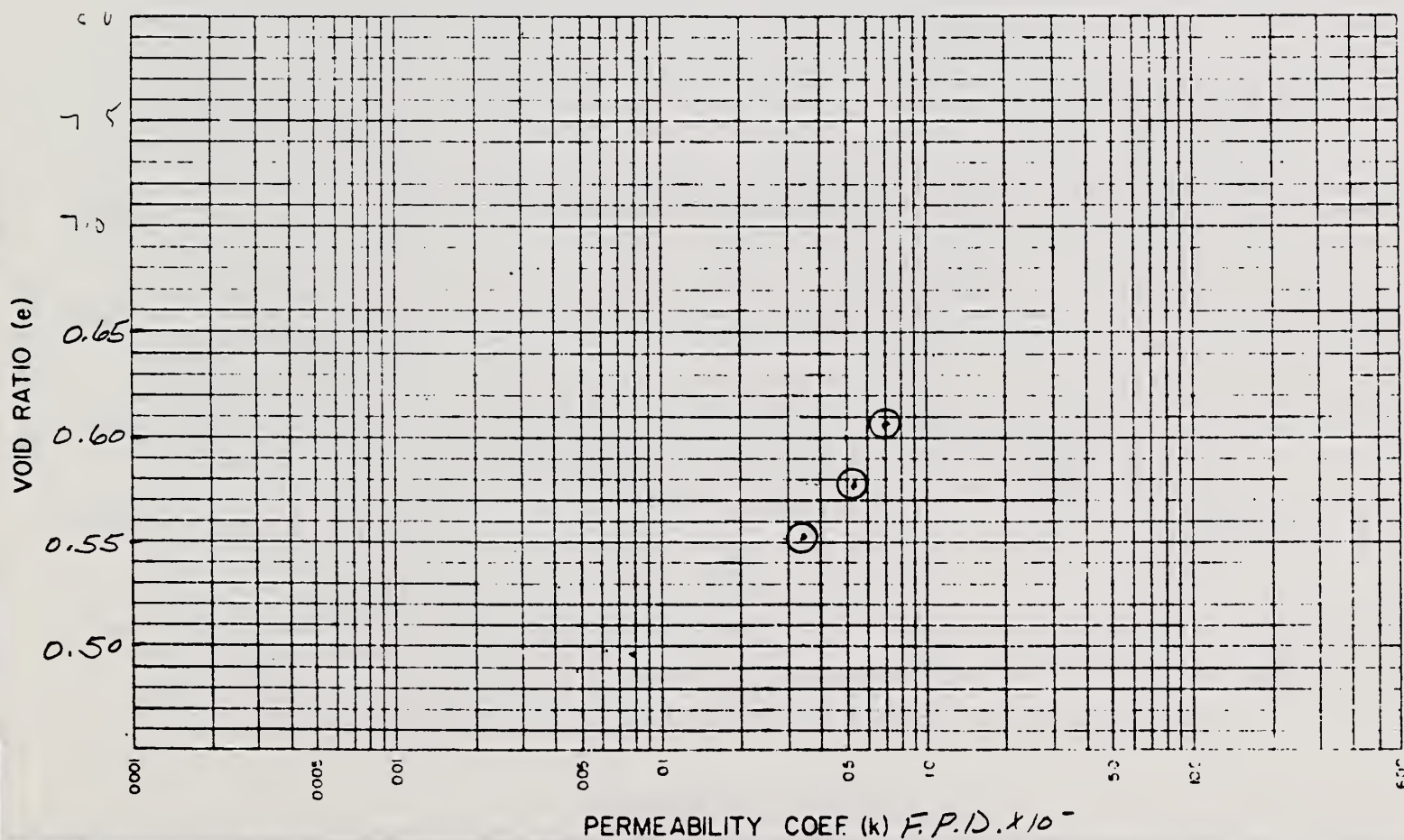


Permeability Coeff., k (fpd)





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE We PP      HIRSH      ORD      NE.			SAMPLE LOCATION HIRSH - Ord, Ne.		
FIELD SAMPLE NO		DEPTH		GEOLOGIC ORIGIN	
TYPE OF SAMPLE Compacted		TESTED AT SML, Lincoln		APPROVED BY	
CLASSIFICATION Non-Plastic SM    LL    PI		SPECIFIC GRAVITY			
TEST NO	2000	4000	8000	4	$G_s(-)^{\#4}$ 2.63
INITIAL MOISTURE %					$G_s(+)^{\#4}$
DRY DENSITY $\square$ g/cc $\square$ pcf	1.65	1.67	1.69		$G_m(\text{Bulk})(+)^{\#4}$
VOID RATIO	.6065	.5788	.5517		TEST SPECIFICATIONS Falling Head Perm.
PERMEABILITY COEF F.P.D.	.7022	.5217	.3549		
PERCOLATION COEF					
$H/L$ DURING TEST					



## REMARKS

$e_0 = 0.894$   
Volume Change = 18%  
 $K$  at  $e_0 \sim 40 \text{ fps}$



Test 2

SCS-ENG-127  
REV. 1-72

LABORATORY NO. 88C 94

MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE <i>Wepp- Hirsch- Ord, Ne</i>			SAMPLE LOCATION		
FIELD SAMPLE NO		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE <i>Compacted</i>		TESTED AT <i>SML, Lincoln</i>	APPROVED BY		DATE
CLASSIFICATION <i>Non-Plastic SMLL</i> <u>    </u> <i>PI</i> <u>    </u>			SPECIFIC GRAVITY		
TEST NO	<i>100</i>	<i>500</i>	<i>1000</i>	<i>2000</i>	$G_s (-)^{\#4}$ <i>2.63</i>
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	<i>1.57</i>	<i>1.64</i>	<i>1.69</i>	<i>1.72</i>	$G_m (Bulk)(+)^{\#4}$
VOID RATIO	<i>.6720</i>	<i>.6014</i>	<i>.5585</i>	<i>.5295</i>	TEST SPECIFICATIONS <i>Falling Head Perm</i>
PERMEABILITY COEF <i>F.P.D.</i>	<i>1.4394</i>	<i>.9671</i>	<i>.31716</i>	<i>.18705</i>	
PERCOLATION COEF					
$H/L$ DURING TEST					

VOID RATIO (e)

Permeability Coef (k) F.P.D.	Void Ratio (e)
0.0014394	0.6720
0.0009671	0.6014
0.00031716	0.5585
0.00018705	0.5295

PERMEABILITY COEF (k) *F.P.D.*

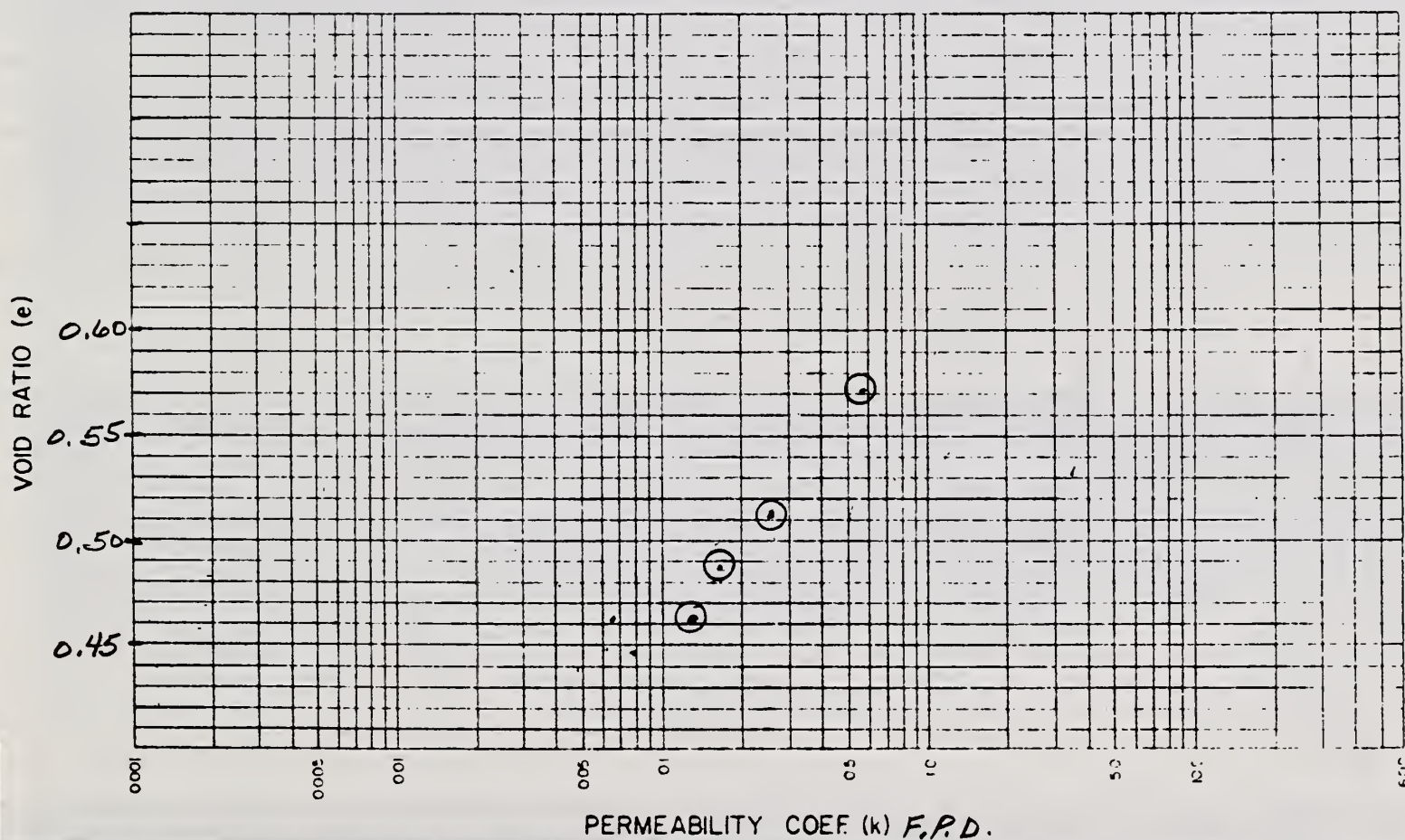
REMARKS  
  
 *$e_o = 0.892$*





MATERIALS TESTING REPORT	U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE	SOIL PERMEABILITY
-----------------------------	--	-------------------

PROJECT and STATE <i>Wepp Hirsch - Ord, Ne.</i>				SAMPLE LOCATION	
FIELD SAMPLE NO.	DEPTH	GEOLOGIC ORIGIN			
TYPE OF SAMPLE <i>Compacted</i>	TESTED AT <i>SML, Lincoln</i>	APPROVED BY			DATE
CLASSIFICATION <i>Non-Plastic SM LL ___ PI ___</i>				SPECIFIC GRAVITY	
TEST NO.	<i>100</i>	<i>500</i>	<i>1000</i>	<i>2000</i>	$G_s (-)^{\#4}$ <i>2.63</i>
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	<i>1.67</i>	<i>1.74</i>	<i>1.77</i>	<i>1.80</i>	$G_m (Bulk)(+)^{\#4}$
VOID RATIO	<i>.5704</i>	<i>.5131</i>	<i>.4881</i>	<i>.4626</i>	TEST SPECIFICATIONS <i>Falling Head Perm</i>
PERMEABILITY COEF. <i>F.P.D.</i>	<i>.58296</i>	<i>.26331</i>	<i>.17082</i>	<i>.14340</i>	
PERCOLATION COEF					
$H/L$ DURING TEST					

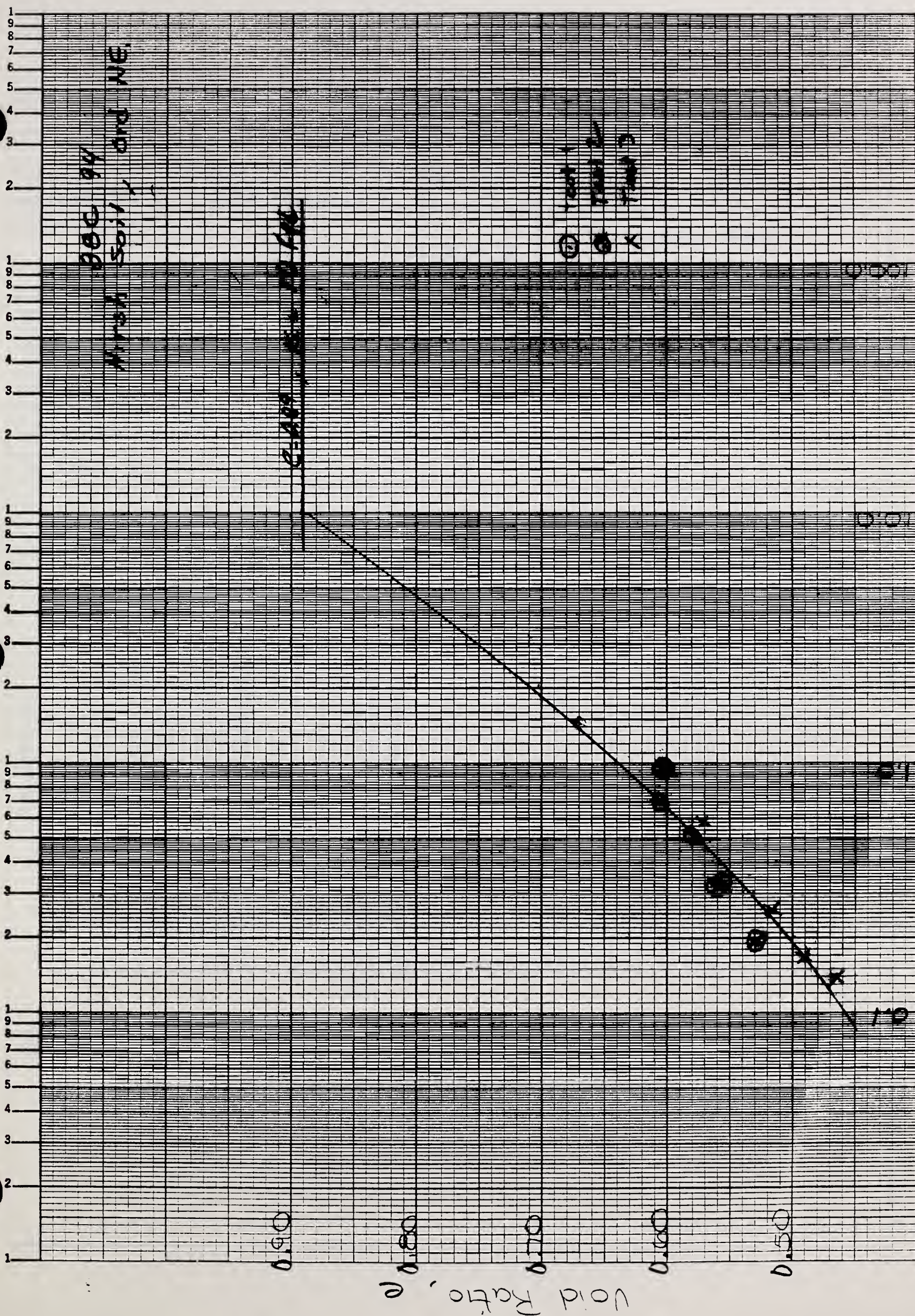


REMARKS

$$e_0 = 0.892$$





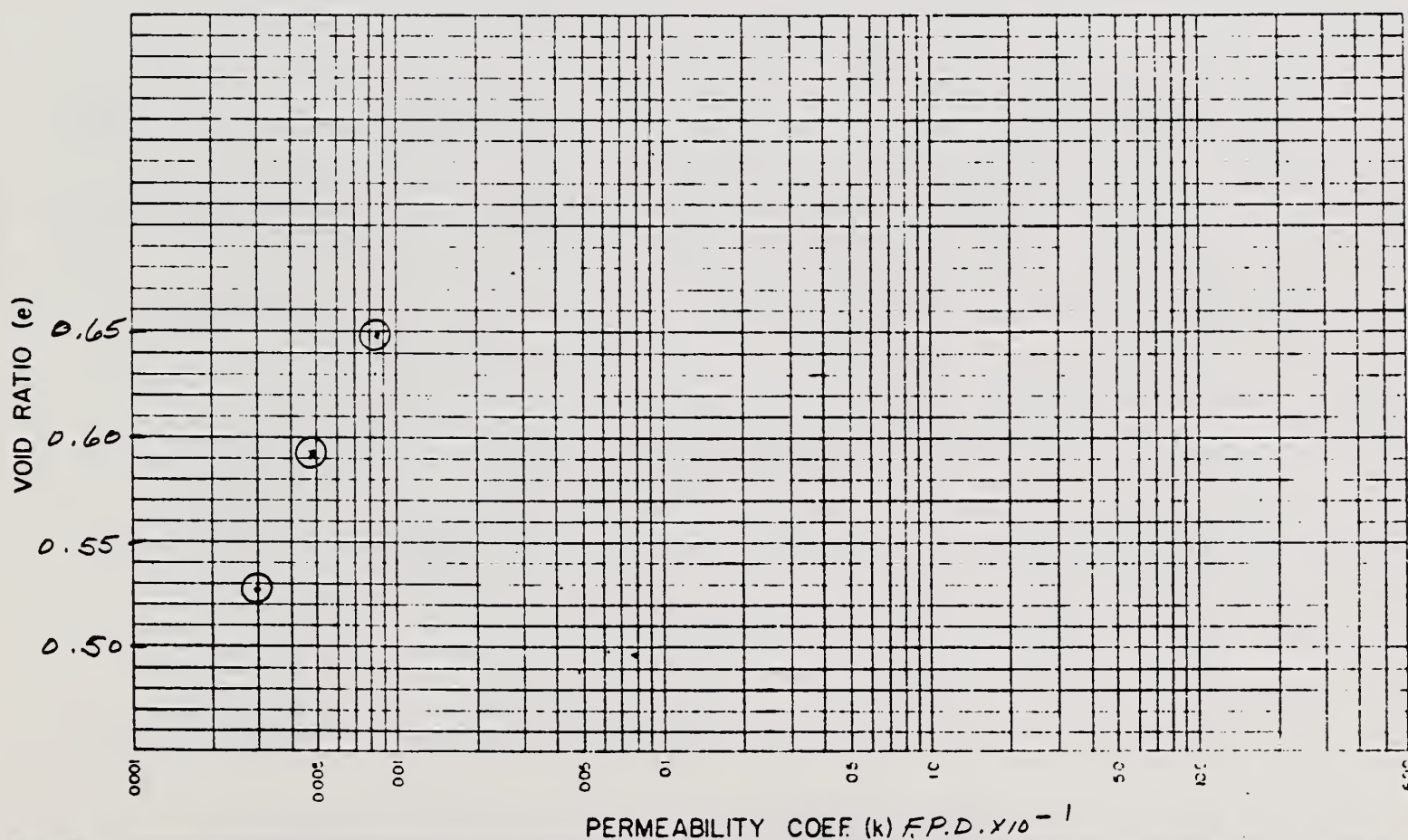


Quantities  $C_{ij}$   $\rightarrow$   $(f_{ij})$





<b>MATERIALS TESTING REPORT</b>		<b>U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE</b>		<b>SOIL PERMEABILITY</b>	
PROJECT and STATE <i>WEPP KEITH ALBION WY.</i>				SAMPLE LOCATION <i>Keith - Albion, WY.</i>	
FIELD SAMPLE NO.		DEPTH		GEOLOGIC ORIGIN	
TYPE OF SAMPLE <i>Compacted</i>		TESTED AT <i>SML, Lincoln</i>		APPROVED BY  DATE	
CLASSIFICATION  <i>CL LL 32 PI 13</i>				SPECIFIC GRAVITY	
TEST NO.	<i>2000</i>	<i>4000</i>	<i>8000</i>	<i>4</i>	$G_s (-)^{\#4}$ <i>2.59</i>
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	<i>1.57</i>	<i>1.63</i>	<i>1.70</i>		$G_m (Bulk)(+)^{\#4}$
VOID RATIO	<i>.6496</i>	<i>.5911</i>	<i>.5265</i>		TEST SPECIFICATIONS <i>Falling Head Perm</i>
PERMEABILITY COEF. <i>F.P.D.</i>	<i>.00085</i>	<i>.00049</i>	<i>.00030</i>		
PERCOLATION COEF					
$H/L$ DURING TEST					



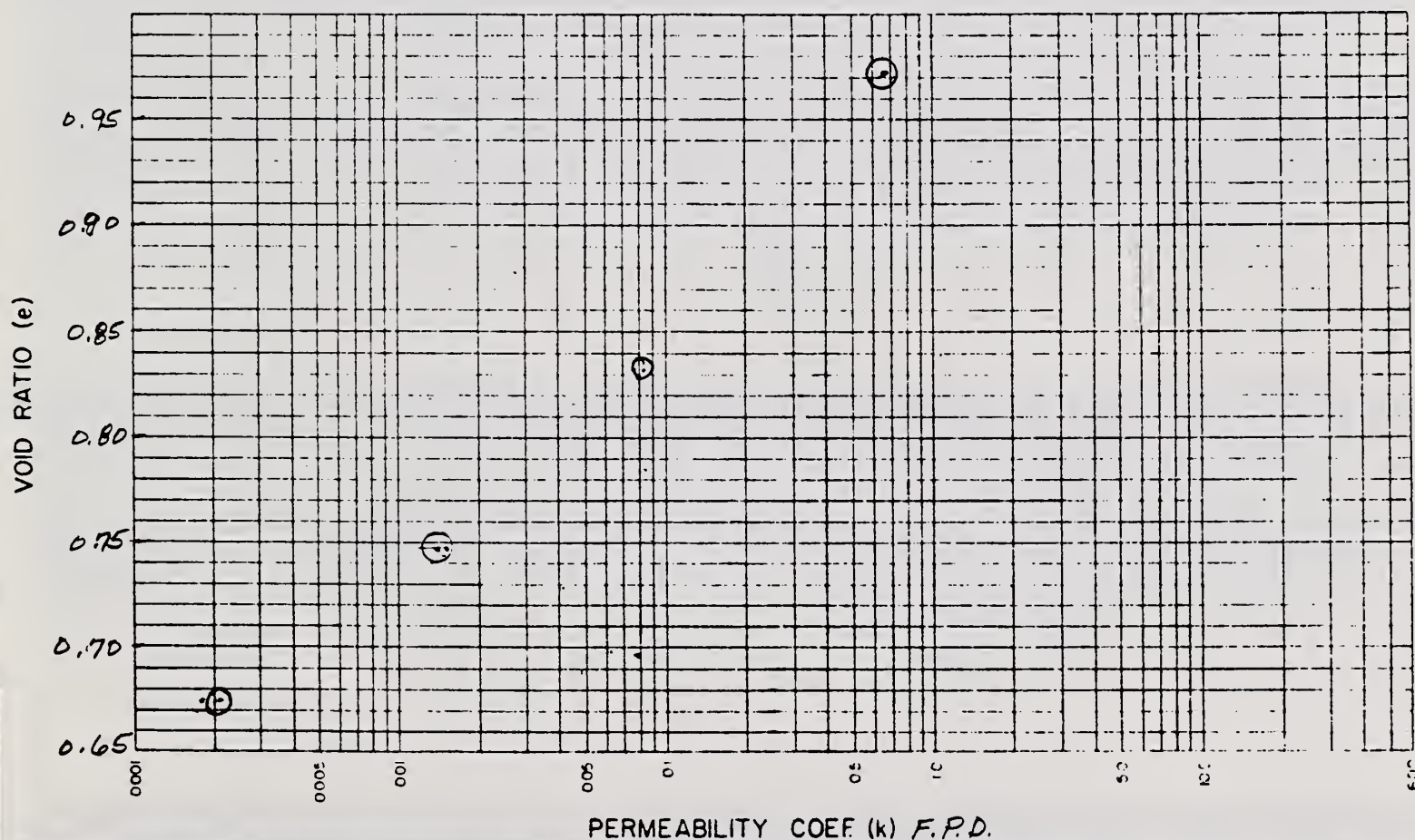
REMARKS

$e_0 = 0.962$

Volume Change ~ 22.2 %



MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE Wepp Keith Albion, WY.				SAMPLE LOCATION	
FIELD SAMPLE NO.		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE Compacted		TESTED AT SML, Lincoln	APPROVED BY		DATE
CLASSIFICATION CL LL 32 PI 13				SPECIFIC GRAVITY	
TEST NO	100	500	1000	2000	$G_s (-)^{\#4}$
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	1.31	1.41	1.48	1.55	$G_m(Bulk)(+)^{\#4}$
VOID RATIO	.9715	.8316	.7475	.6737	TEST SPECIFICATIONS Falling Head Perm.
PERMEABILITY COEF F.P.D.	.68500	.08395	.01575	.00209	
PERCOLATION COEF					
$H/L$ DURING TEST					



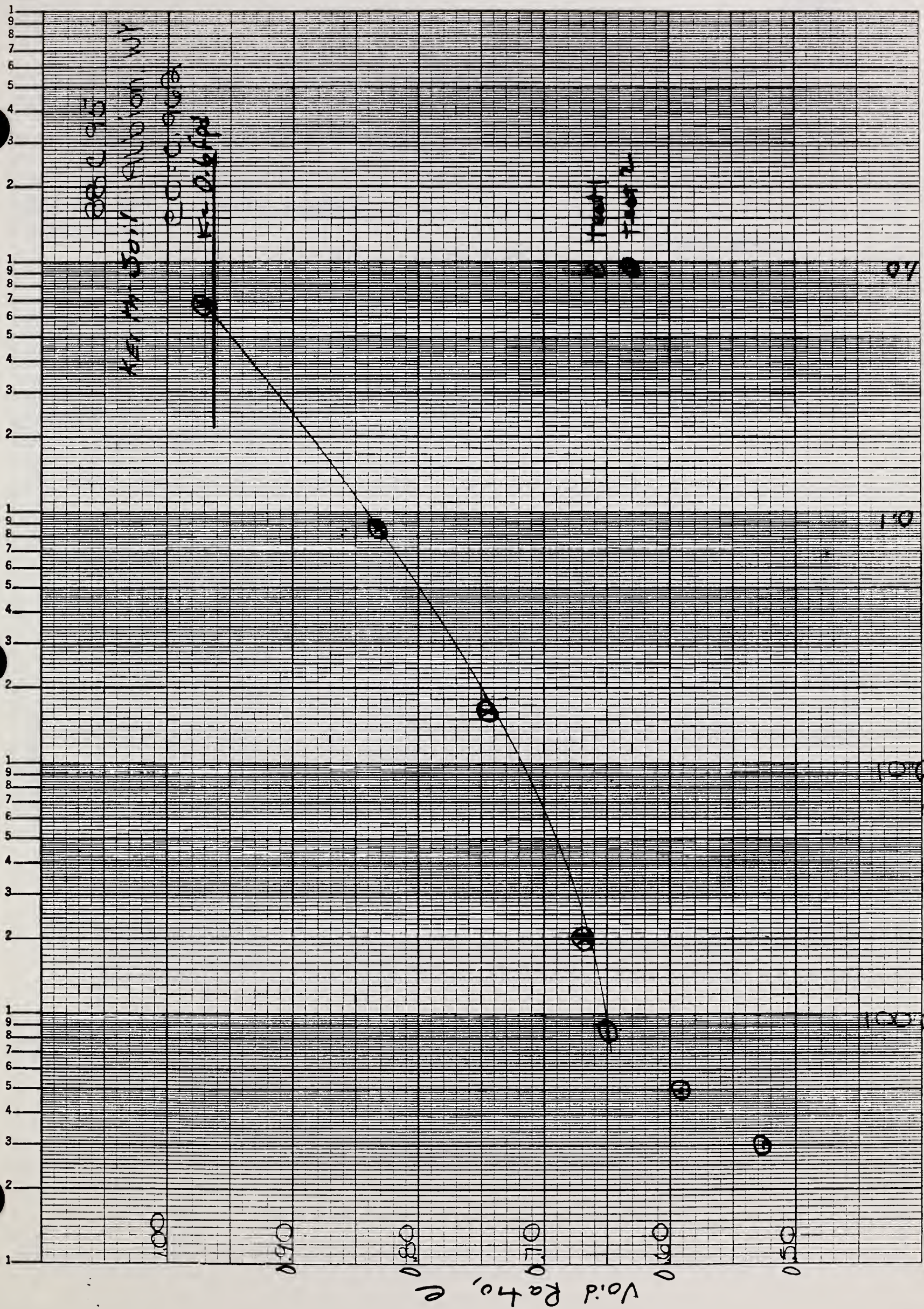
REMARKS

$$e_0 = 0.962$$





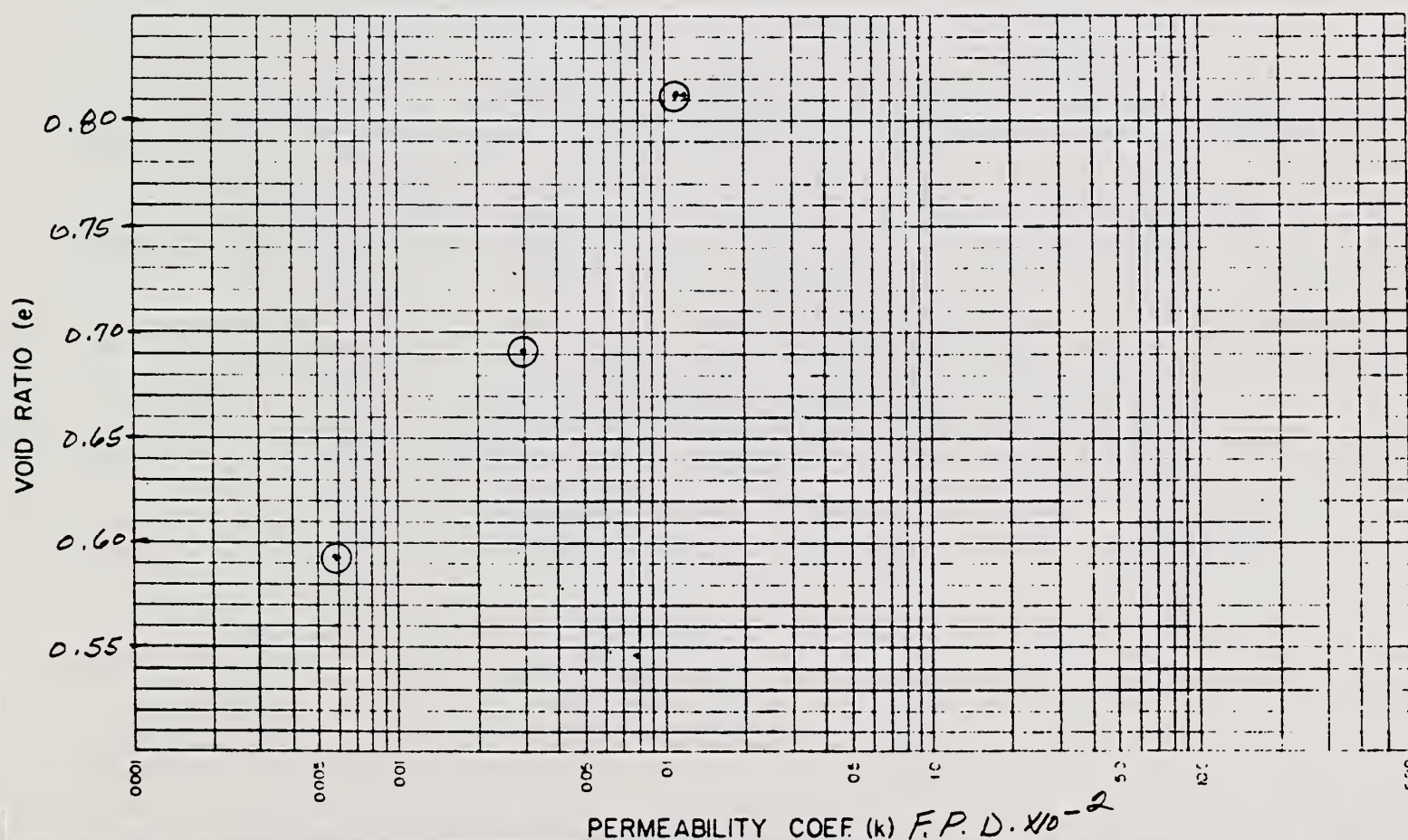








MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE <i>WE PP - LOS BANOS - FRESNO, CA.</i>				SAMPLE LOCATION	
FIELD SAMPLE NO		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE <i>Compacted</i>		TESTED AT <i>SML, Lincoln</i>	APPROVED BY		DATE
CLASSIFICATION <i>CL LL 46 PI 25</i>				SPECIFIC GRAVITY	
TEST NO	<i>2000</i>	<i>4000</i>	<i>8000</i>	<i>4</i>	$G_s (-)^{\#4}$ <i>2.61</i>
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	<i>1.44</i>	<i>1.54</i>	<i>1.64</i>		$G_m(\text{Bulk})(+)^{\#4}$
VOID RATIO	<i>.8133</i>	<i>.7003</i>	<i>.5922</i>		TEST SPECIFICATIONS <i>Falling Head Perm</i>
PERMEABILITY COEF <i>F.P.D.</i>	<i>.00122</i>	<i>.00030</i>	<i>.00006</i>		
PERCOLATION COEF					
$H/L$ DURING TEST					



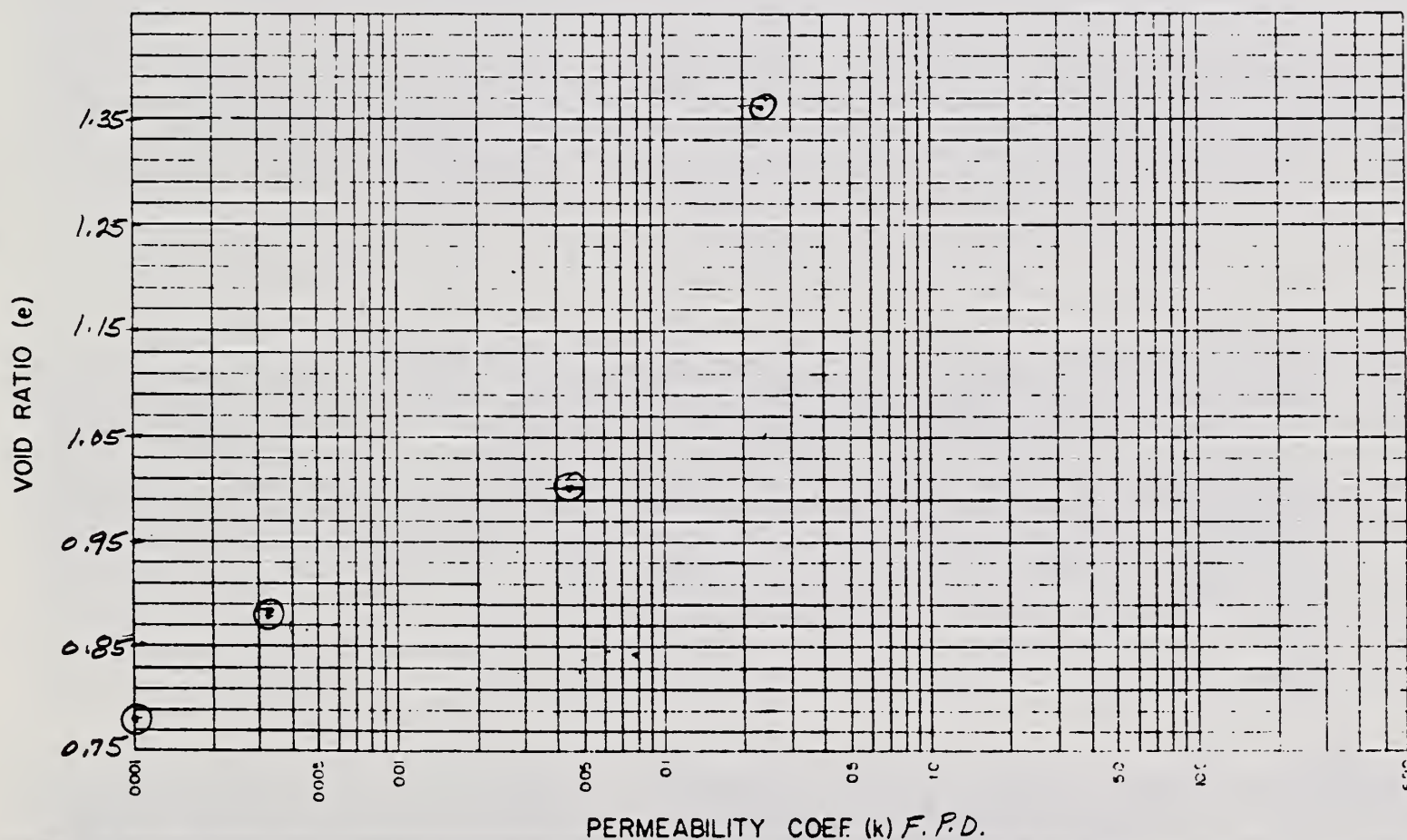
## REMARKS

$e_0 = 1.61$   
Volume Change = 39%





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE We PP - Los Banos - Fresno, CA.			SAMPLE LOCATION		
FIELD SAMPLE NO	DEPTH	GEOLOGIC ORIGIN			
TYPE OF SAMPLE Compacted	TESTED AT SML, Lincoln	APPROVED BY		DATE	
CLASSIFICATION CL LL 46 PI 25			SPECIFIC GRAVITY		
TEST NO	100	500	1000	2000	$G_s (-) \#4$ 2.61
INITIAL MOISTURE %					$G_s (+) \#4$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	1.10	1.30	1.38	1.46	$G_m (\text{Bulk})(+) \#4$
VOID RATIO	1.3613	1.0145	.8860	.7822	TEST SPECIFICATIONS Falling Head Perm
PERMEABILITY COEF F.P.D.	2.3222	.04591	.00327	.00100	
PERCOLATION COEF					
$H/L$ DURING TEST					



REMARKS

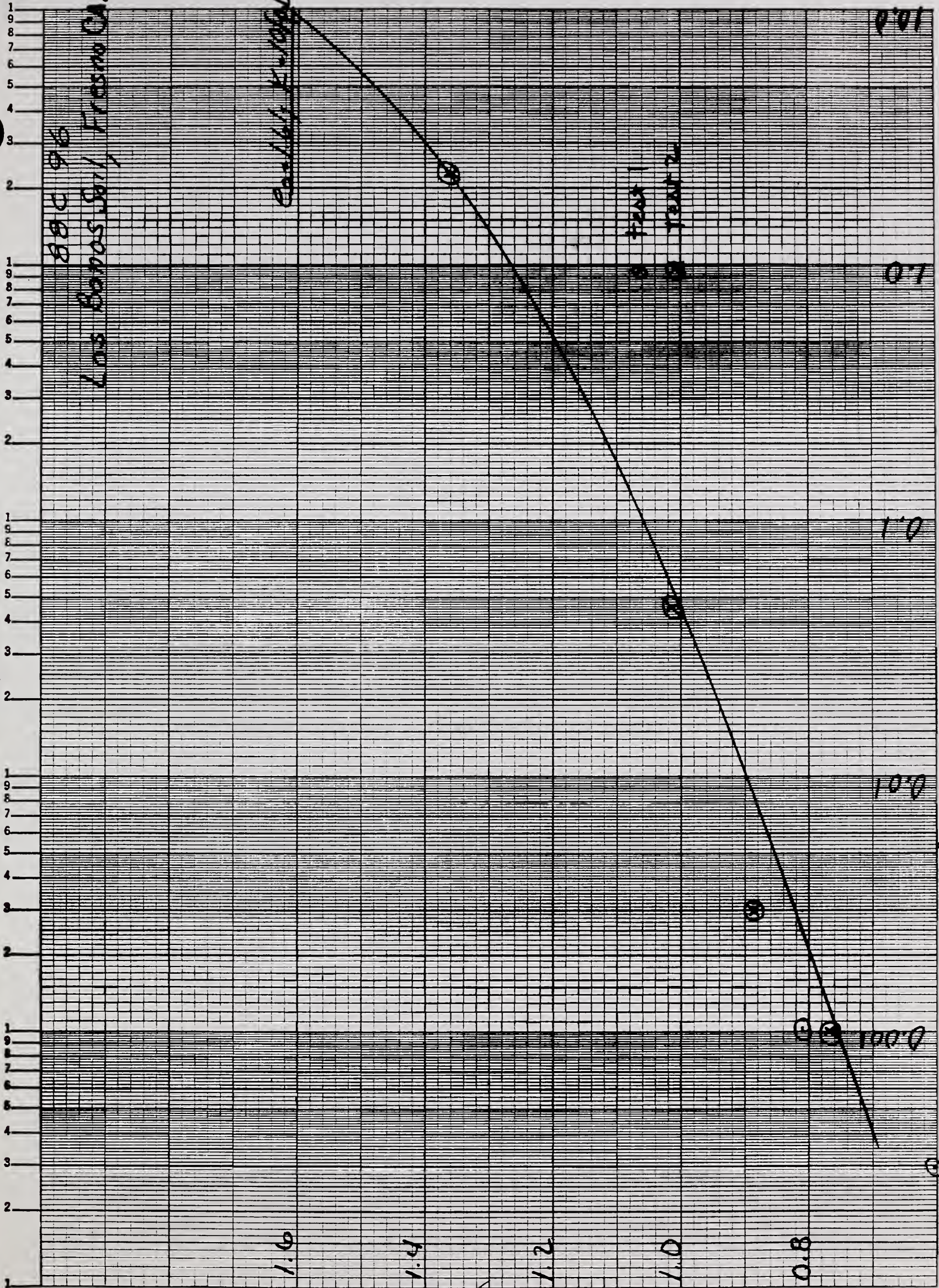
$$e_0 = 1.61$$





880 C 96  
Los Banos, Calif., Fresno Co.

Coef. of Permeability

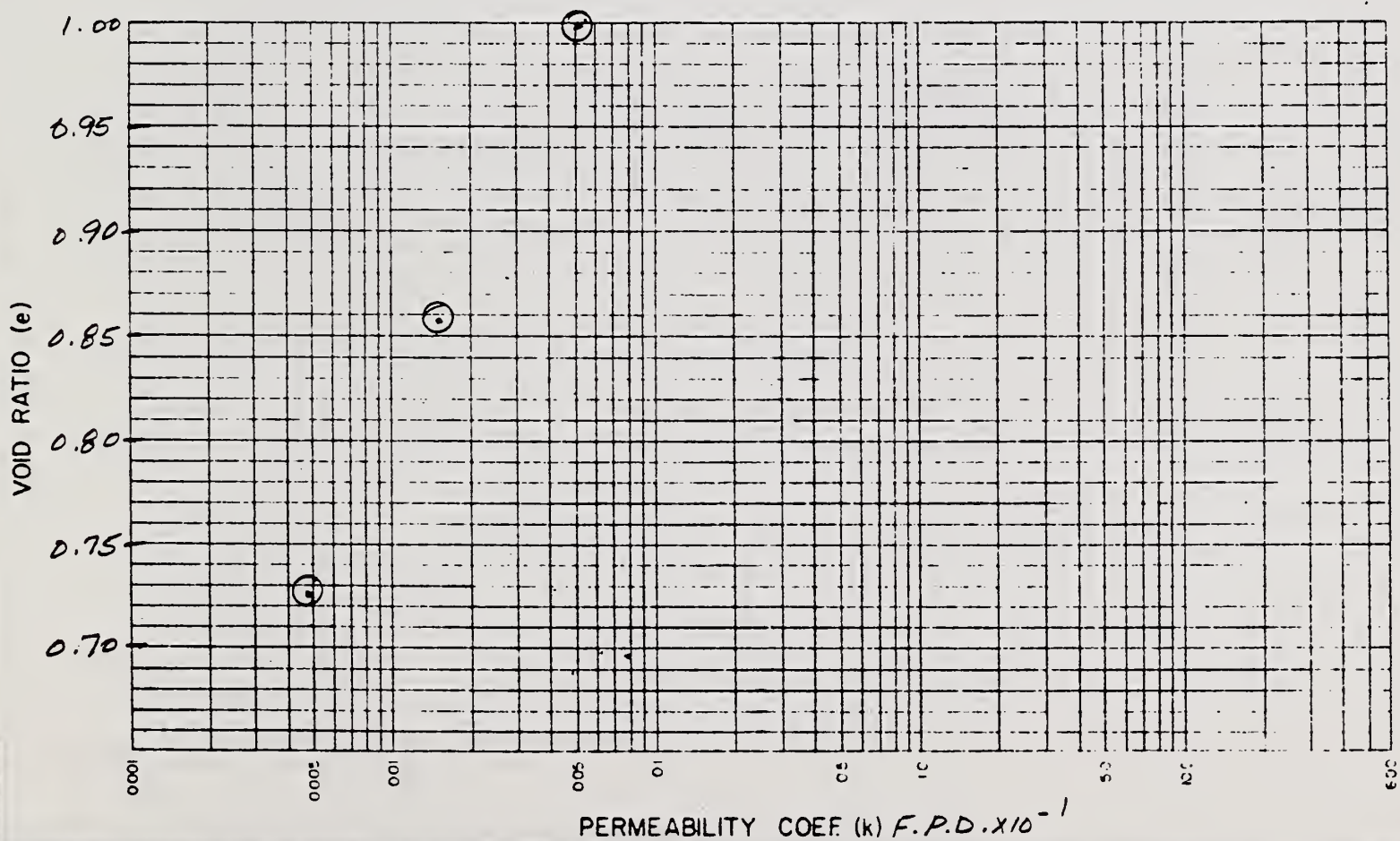


Permeability Coef.,  $K$  (cpd)





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE <i>Wepp - Pierre - Cottonwood, S.D.</i>				SAMPLE LOCATION	
FIELD SAMPLE NO.		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE <i>Compacted</i>		TESTED AT <i>SML, Lincoln</i>	APPROVED BY		DATE
CLASSIFICATION <i>CH LL 52 PI 32</i>				SPECIFIC GRAVITY	
TEST NO.	<i>20100</i>	<i>40200</i>	<i>80300</i>	<i>4</i>	$G_s (-)^{\#4}$ <i>2.71</i>
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	<i>1.36</i>	<i>1.46</i>	<i>1.57</i>		$G_m (Bulk)(+)^{\#4}$
VOID RATIO	<i>.9999</i>	<i>.8577</i>	<i>.7258</i>		TEST SPECIFICATIONS <i>Falling Head Perm.</i>
PERMEABILITY COEF <i>F.P.D.</i>	<i>.00518</i>	<i>.00160</i>	<i>.00049</i>		
PERCOLATION COEF					
$H/L$ DURING TEST					

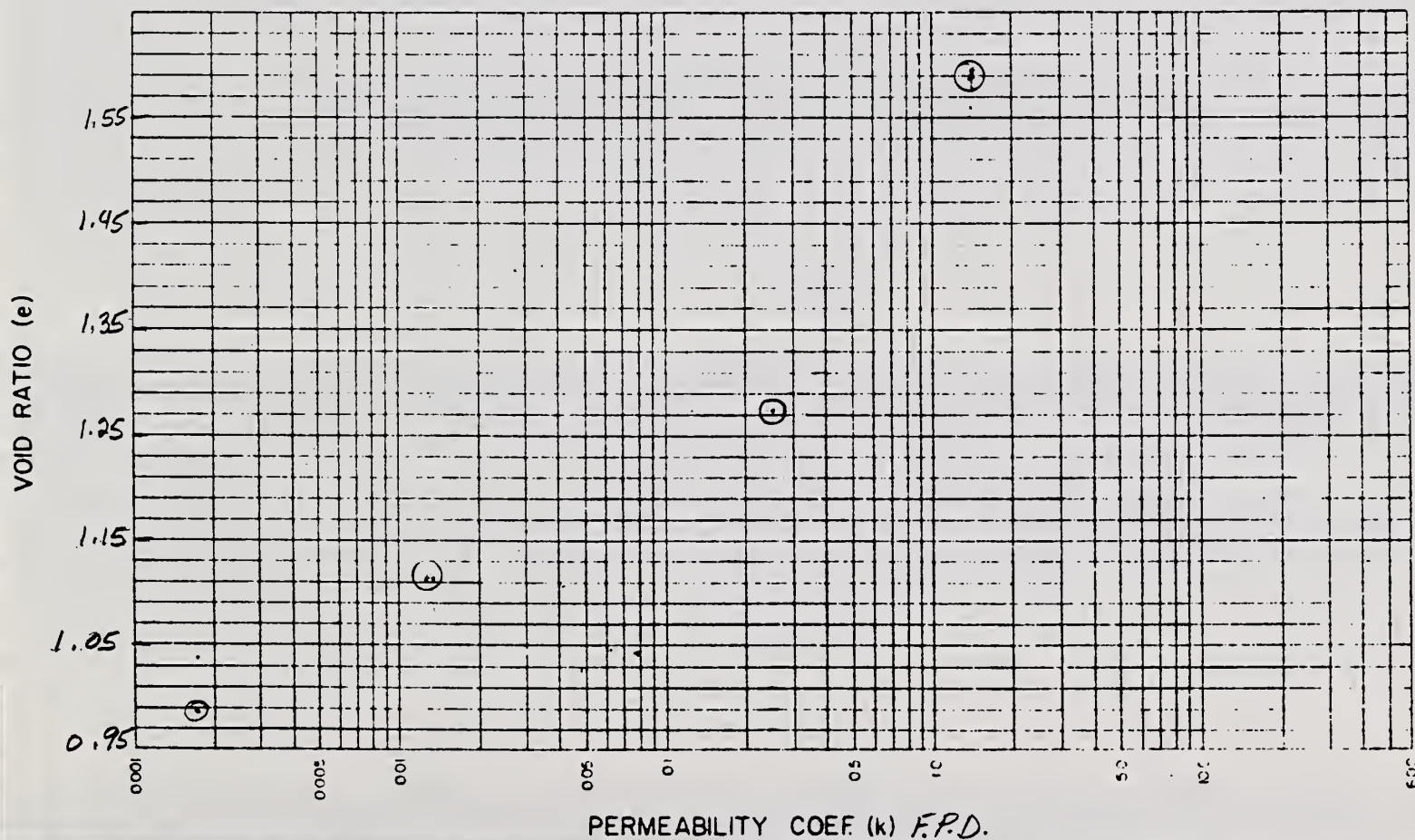


REMARKS

$$e_0 = 1.581$$



MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE <i>Wepp. Pierre - Cottonwood, SD.</i>			SAMPLE LOCATION		
FIELD SAMPLE NO	DEPTH	GEOLOGIC ORIGIN			
TYPE OF SAMPLE <i>Compacted</i>	TESTED AT <i>SML, Lincoln</i>	APPROVED BY		DATE	
CLASSIFICATION <i>CH LL 52 PI 32</i>			SPECIFIC GRAVITY		
TEST NO	<i>100</i>	<i>500</i>	<i>1000</i>	<i>2000</i>	$G_s (-)^{\#4}$ <i>2.71</i>
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	<i>1.04</i>	<i>1.19</i>	<i>1.28</i>	<i>1.37</i>	$G_m (Bulk)(+)^{\#4}$
VOID RATIO	<i>1.5976</i>	<i>1.2719</i>	<i>1.1168</i>	<i>.9836</i>	TEST SPECIFICATIONS <i>Falling Head Perm.</i>
PERMEABILITY COEF <i>F.P.D.</i>	<i>1.5267</i>	<i>.25252</i>	<i>.01389</i>	<i>.00175</i>	
PERCOLATION COEF					
$H/L$ DURING TEST					



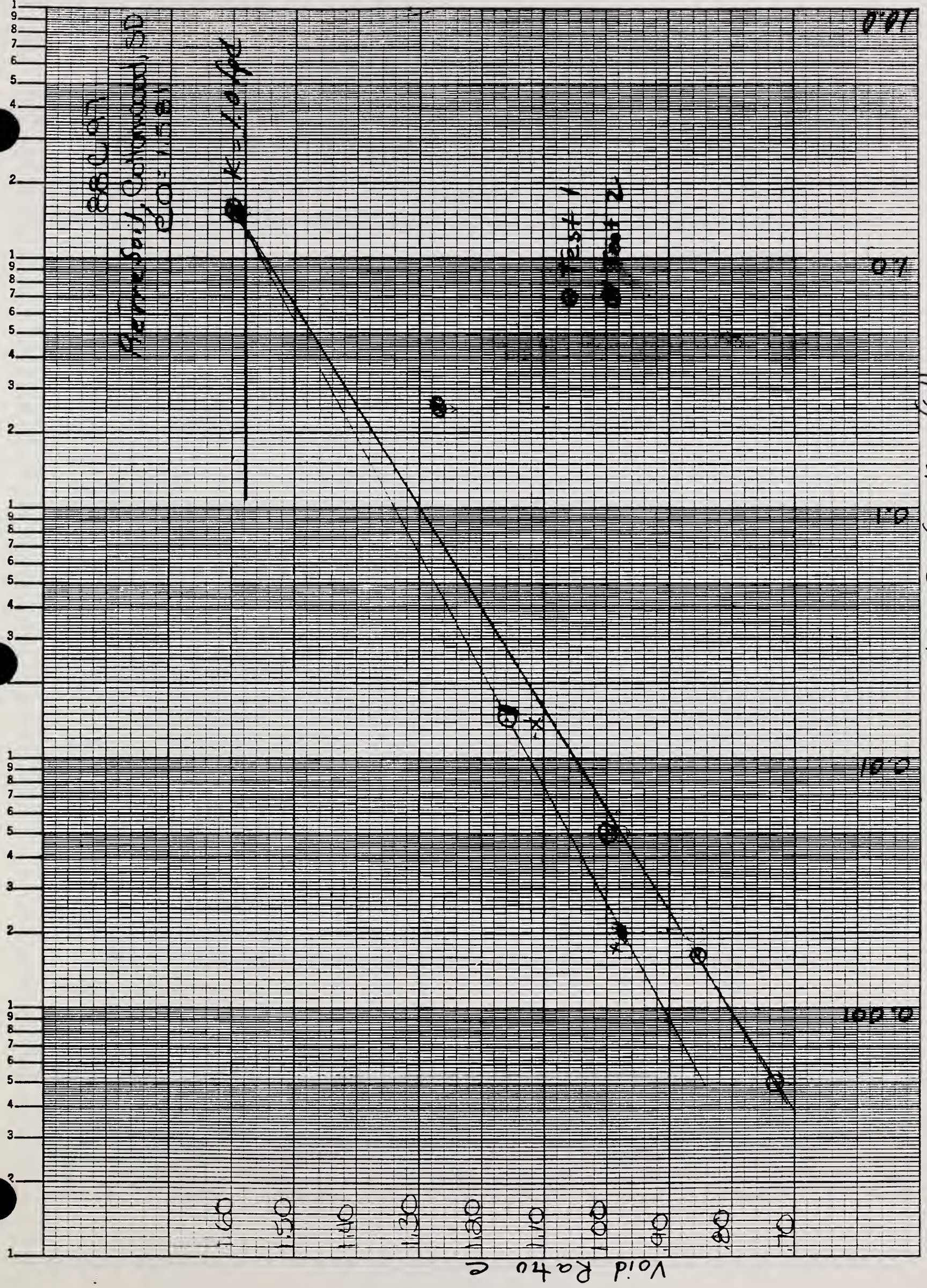
REMARKS

 $e_0 = 1.581$









Permeability Coefficient,  $K$  (ft/d)

Test 1

Test 2

10.0

0.1

1.0

10.0

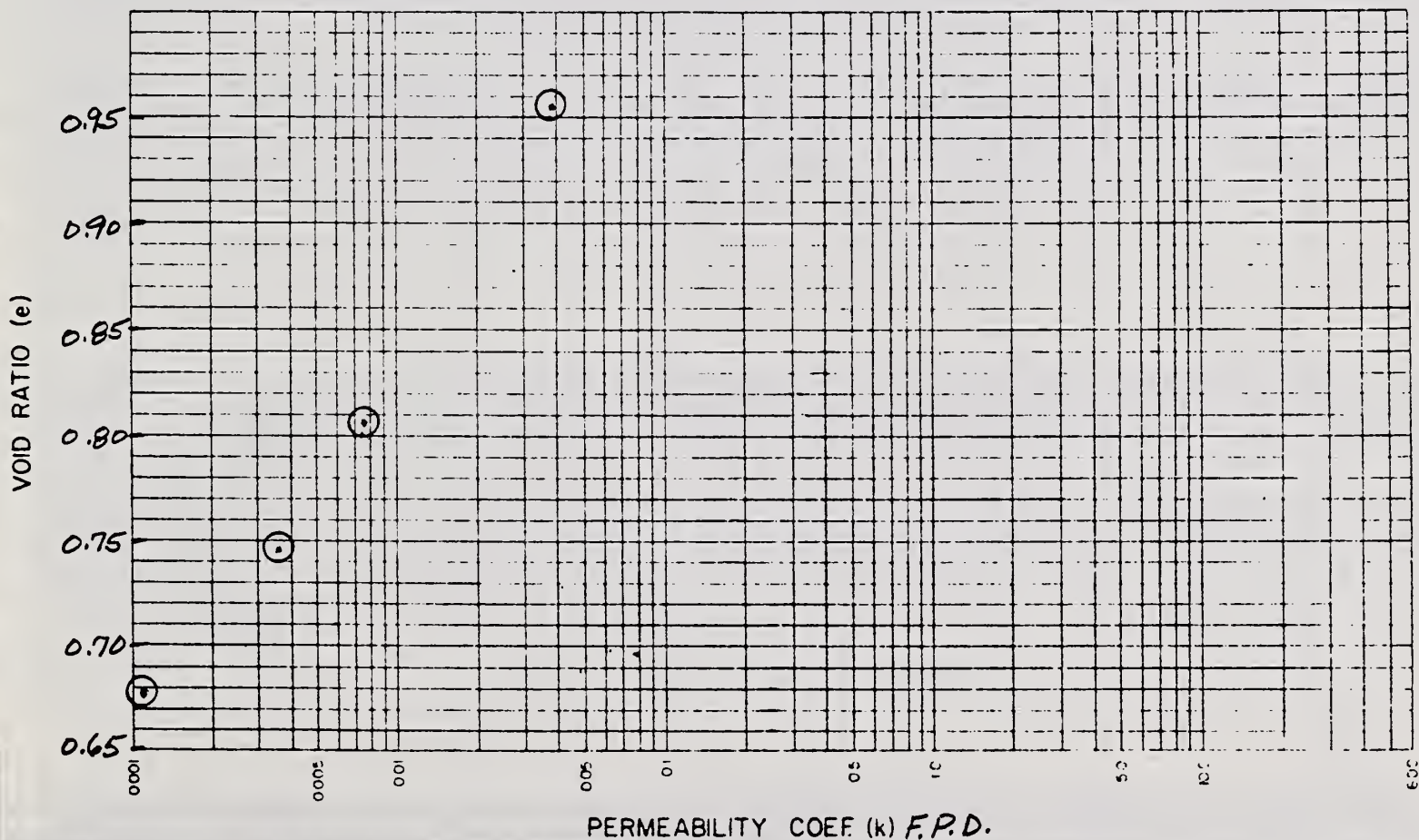
0.001





<b>MATERIALS TESTING REPORT</b>	U. S. DEPARTMENT of AGRICULTURE <b>SOIL CONSERVATION SERVICE</b>	<b>SOIL PERMEABILITY</b>
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PROJECT and STATE <i>We PP - PALouse - Pullman, Wa.</i>					SAMPLE LOCATION	
FIELD SAMPLE NO		DEPTH		GEOLOGIC ORIGIN		
TYPE OF SAMPLE <i>Compacted</i>		TESTED AT <i>SML, Lincoln</i>		APPROVED BY		DATE
CLASSIFICATION  <i>CL LL 31 PI 13</i>					SPECIFIC GRAVITY	
TEST NO	<i>106</i>	<i>580</i>	<i>1000</i>	<i>2000</i>	$G_s (-)^{\#4}$	<i>2.64</i>
INITIAL MOISTURE %					$G_s (+)^{\#4}$	
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	<i>1.35</i>	<i>1.46</i>	<i>1.51</i>	<i>1.57</i>	$G_m (Bulk)(+)^{\#4}$	
VOID RATIO	<i>.9552</i>	<i>.8083</i>	<i>.7459</i>	<i>.6797</i>	TEST SPECIFICATIONS <i>Falling Head Perm.</i>	
PERMEABILITY COEF <i>F.P.D.</i>	<i>.03979</i>	<i>.00753</i>	<i>.00364</i>	<i>.00118</i>		
PERCOLATION COEF						
$H/L$ DURING TEST						

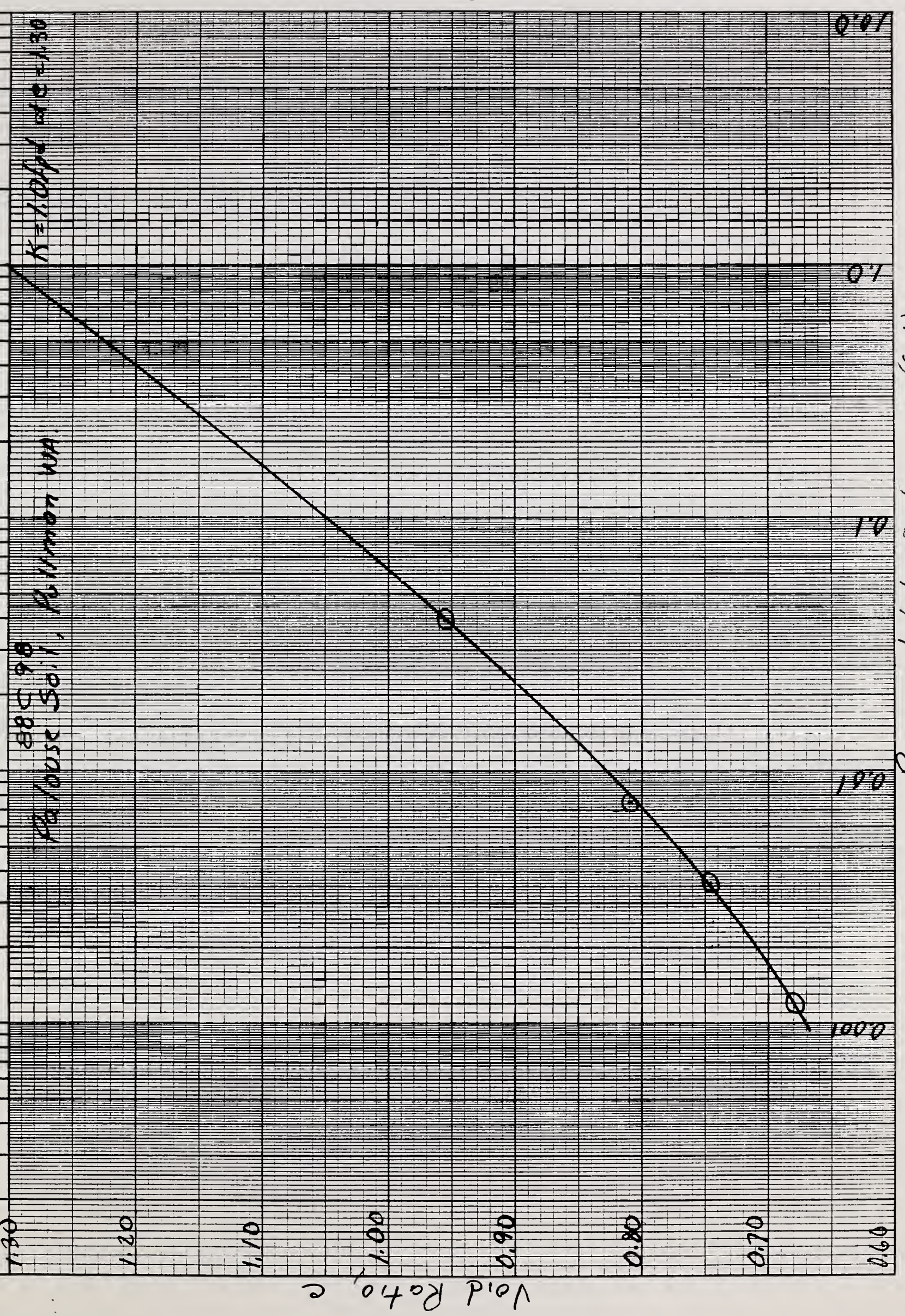


REMARKS







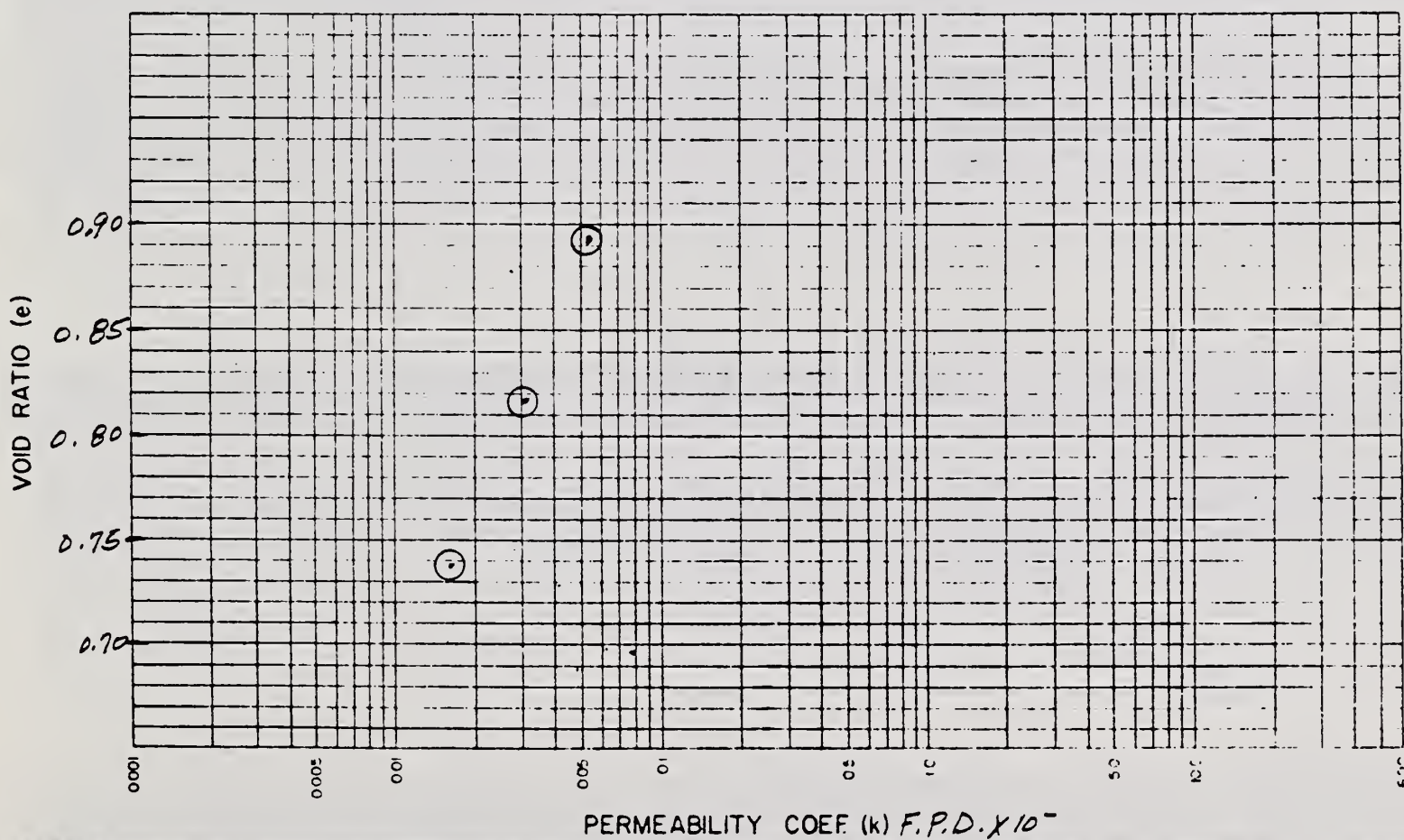


88C 98  
Pavuse 50.1, Blumson WA.





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE WEPP		PORTNEUF KIMBERLY ID.		SAMPLE LOCATION Portneuf-Kimberly, ID.	
FIELD SAMPLE NO.		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE Compacted		TESTED AT SML, Lincoln		APPROVED BY	DATE
CLASSIFICATION CL-ML LL 28 PI 4				SPECIFIC GRAVITY	
TEST NO.	2000	4000	8000	4	$G_s (-)^{\#4}$ 2.66
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	1.40	1.46	1.53		$G_m (Bulk)(+)^{\#4}$
VOID RATIO	.8939	.8167	.7386		TEST SPECIFICATIONS Falling Head Perm.
PERMEABILITY COEF. F.P.D.	.05286	.03103	.01742		
PERCOLATION COEF					
$H/L$ DURING TEST					



## REMARKS

$e_0 = 1.127$   
Volume Change = 18.3%  
 $K$  at  $e_0 =$





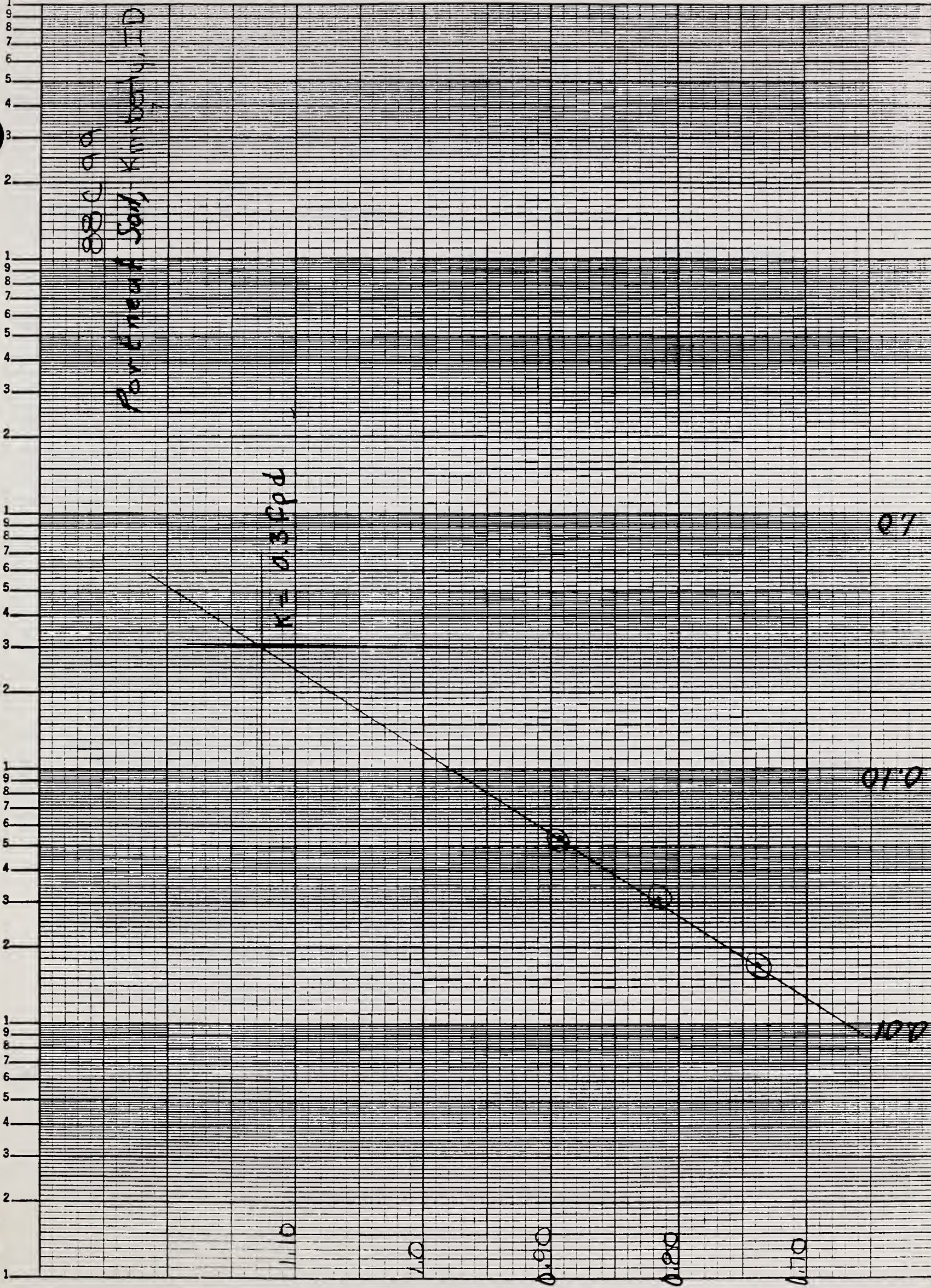


9800 99  
Poreneat Sand, Kimberly, ID

$K = 0.3 \text{ ffd}$

Void Ratio,  $e$

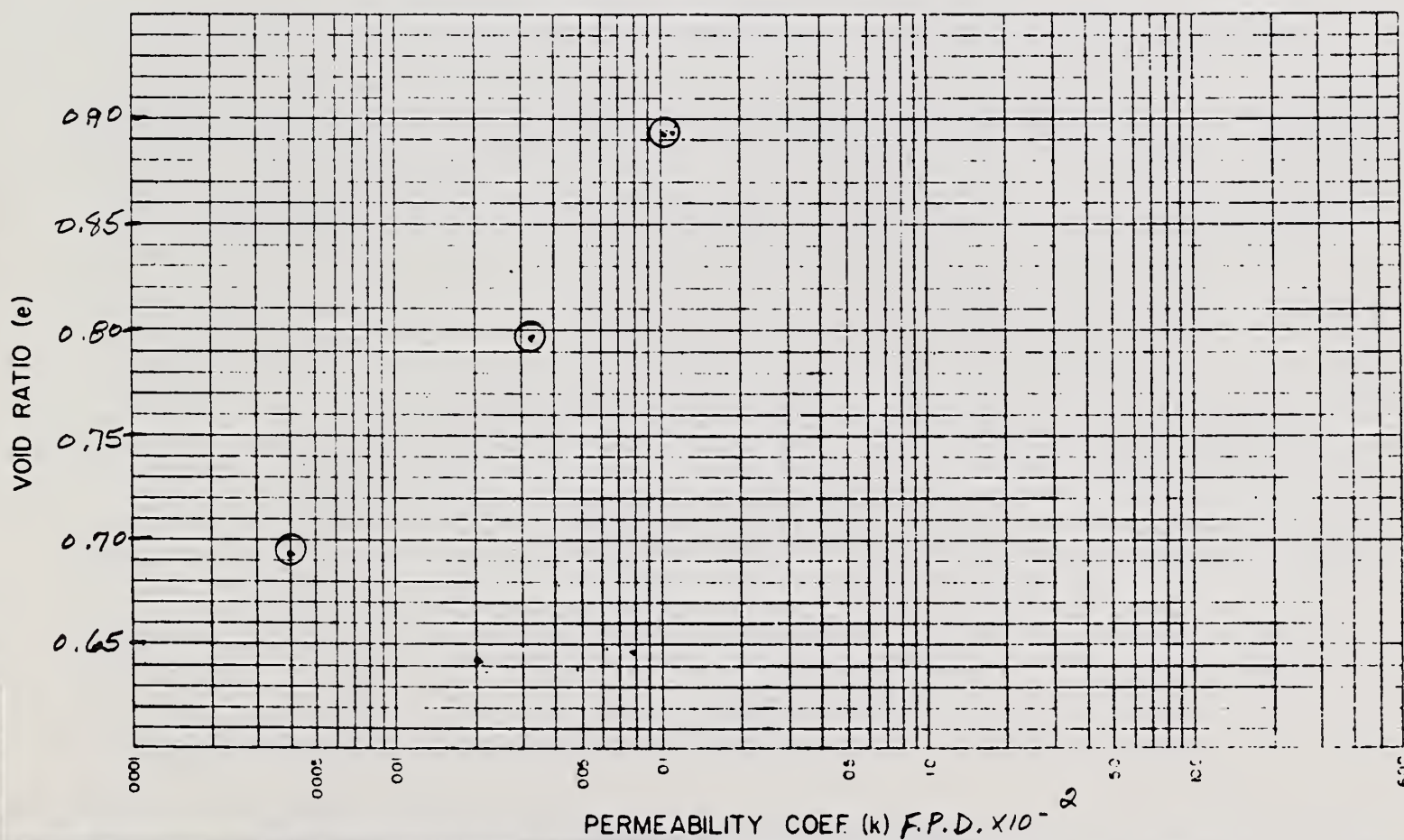
Permeability Coef,  $K$  (ffd)







MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY			
PROJECT and STATE <i>We PP - Sharpsburg, Lincoln, Ne</i>				SAMPLE LOCATION			
FIELD SAMPLE NO		DEPTH		GEOLOGIC ORIGIN			
TYPE OF SAMPLE <i>Compacted</i>		TESTED AT <i>SML, Lincoln</i>		APPROVED BY DATE			
CLASSIFICATION <i>CL LL 49 PI 30</i>				SPECIFIC GRAVITY			
TEST NO.		<i>2000</i>	<i>4000</i>	<i>8000</i>	<i>4</i>	$G_s (-)^{\#4}$	<i>2.63</i>
INITIAL MOISTURE %						$G_s (+)^{\#4}$	
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf		<i>1.39</i>	<i>1.46</i>	<i>1.55</i>		$G_m (Bulk)(+)^{\#4}$	
VOID RATIO		<i>.8945</i>	<i>.7976</i>	<i>.6922</i>		TEST SPECIFICATIONS <i>Falling Head Perm</i>	
PERMEABILITY COEF. F.P.D.		<i>.00116</i>	<i>.00032</i>	<i>.00004</i>			
PERCOLATION COEF							
$H/L$ DURING TEST							



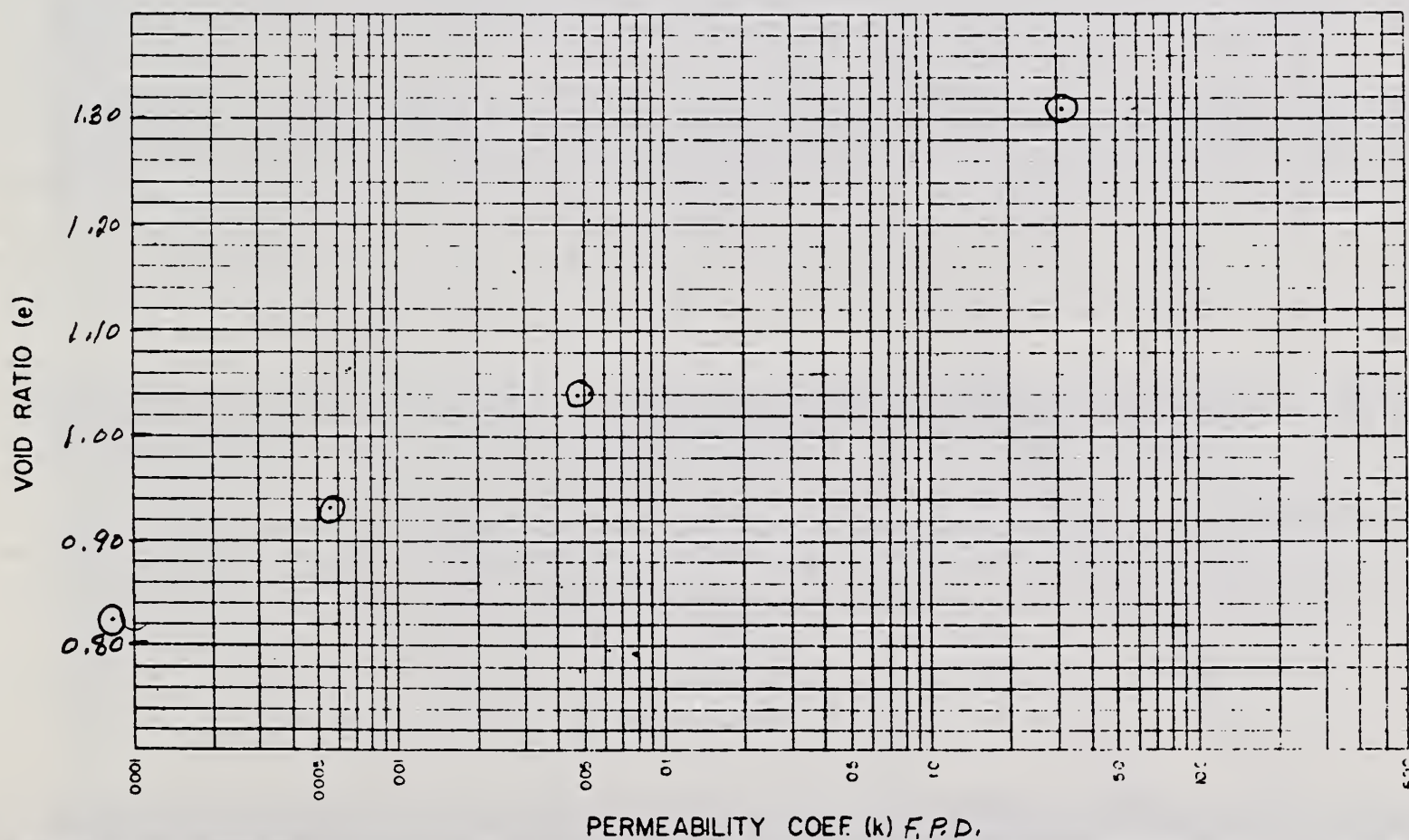
REMARKS

 $C_0 = 1.307$





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE <i>Wepp - Sharpsburg - Lincoln, Ne</i>			SAMPLE LOCATION		
FIELD SAMPLE NO.		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE <i>Compacted</i>		TESTED AT <i>SML, Lincoln</i>	APPROVED BY		DATE
CLASSIFICATION <i>CL LL 49 PI 30</i>				SPECIFIC GRAVITY	
TEST NO.	<i>100</i>	<i>500</i>	<i>1000</i>	<i>2000</i>	$G_s (-) \#4$ <i>2.63</i>
INITIAL MOISTURE %					$G_s (+) \#4$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	<i>1.14</i>	<i>1.29</i>	<i>1.36</i>	<i>1.44</i>	$G_m (Bulk) (+) \#4$
VOID RATIO	<i>1.3084</i>	<i>1.0424</i>	<i>.9307</i>	<i>.8222</i>	TEST SPECIFICATIONS <i>Falling Head Perm</i>
PERMEABILITY COEF <i>F.P.D.</i>	<i>5.7984</i>	<i>.05329</i>	<i>.00685</i>	<i>.00104</i>	
PERCOLATION COEF					
$H/L$ DURING TEST					



REMARKS

$$e_0 = 1.307$$





880 100  
 Sharpburg Soil, Lincoln NE

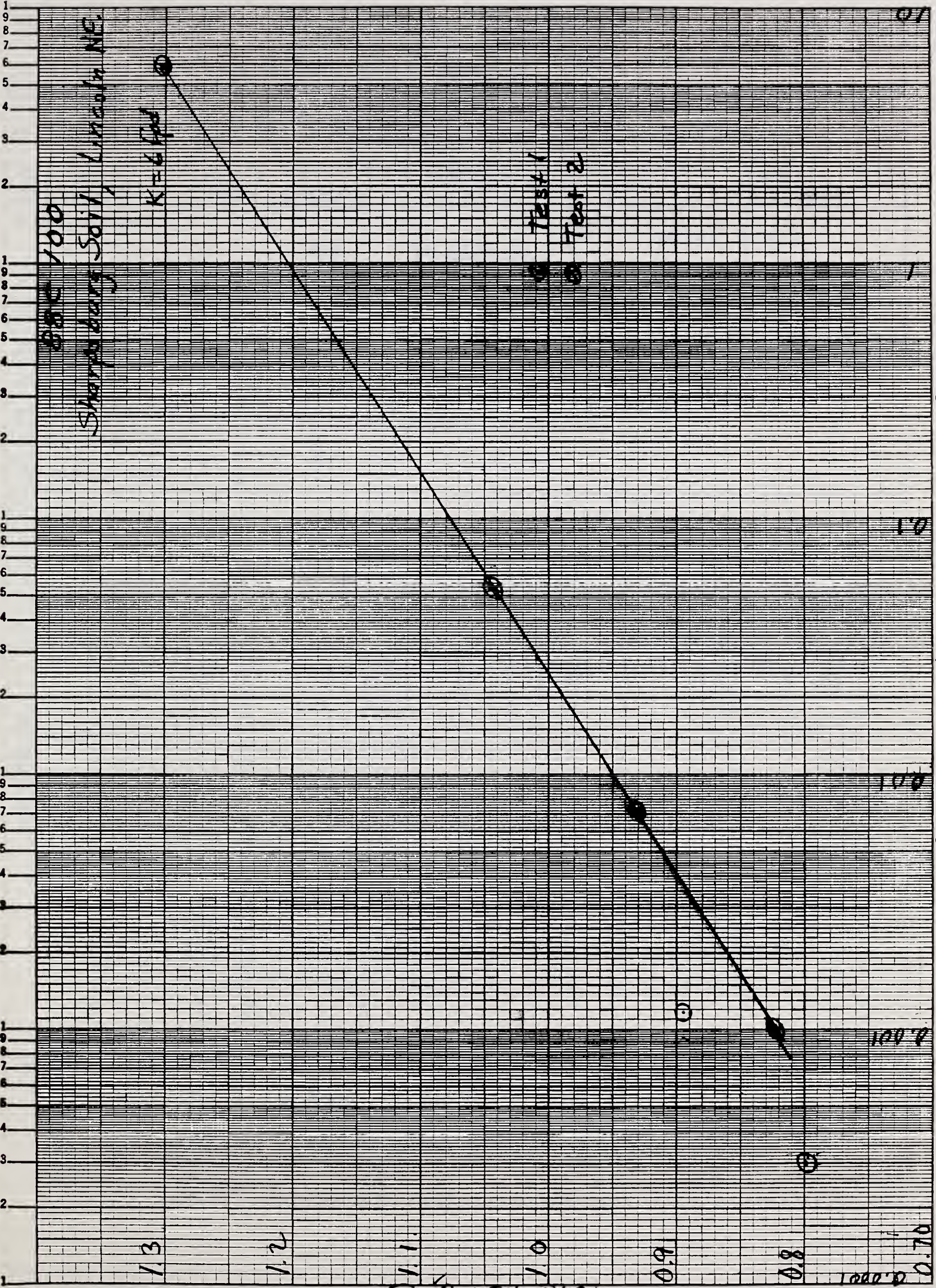
$K = 6 \text{ fpd}$

Test 1

Test 2

Void Ratio,  $e$

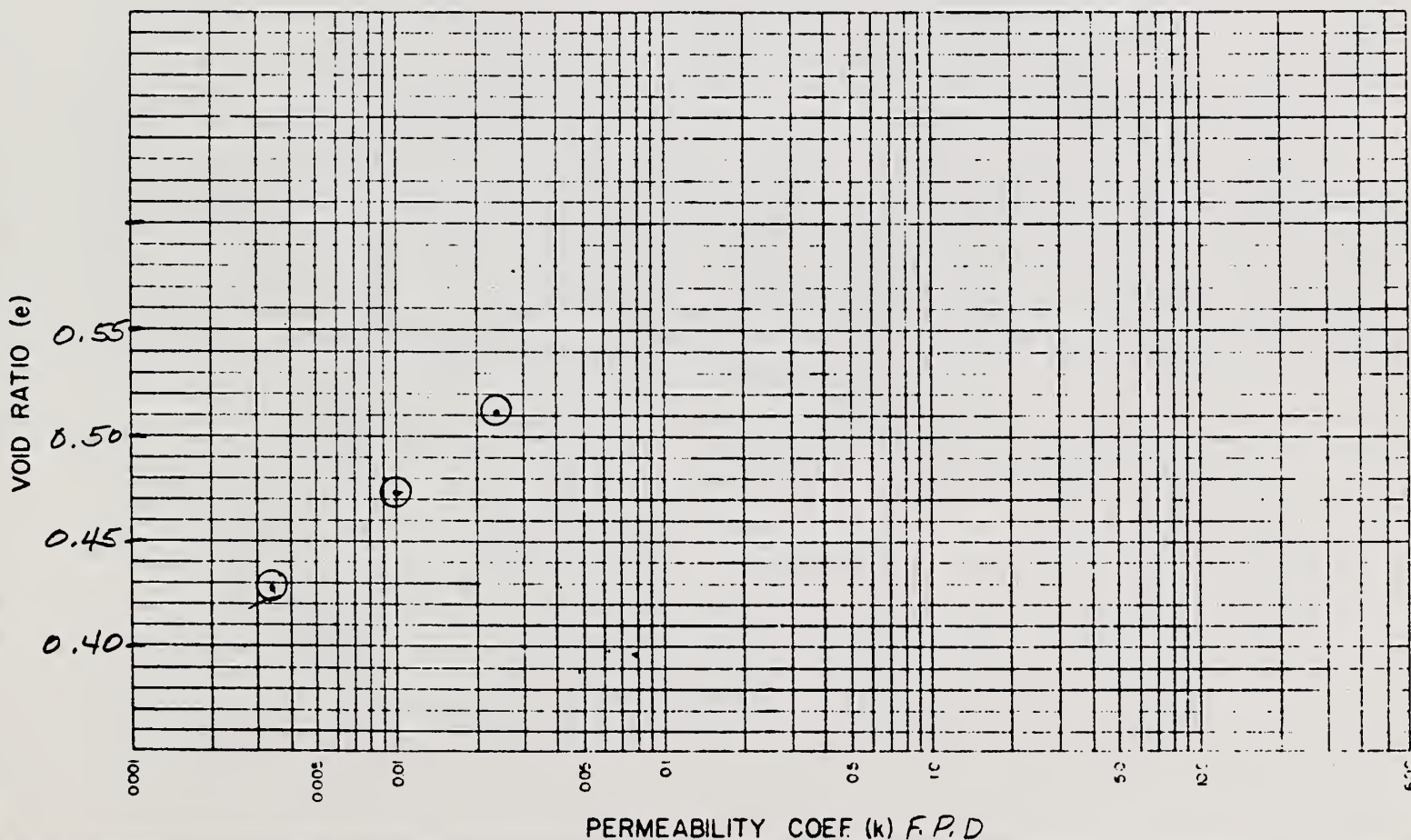
Permeability Coef.  $k$  fpd







MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE <i>Wepp - Sverdrup, Morris, MN.</i>				SAMPLE LOCATION	
FIELD SAMPLE NO.		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE <i>Compacted</i>		TESTED AT <i>SML, Lincoln</i>		APPROVED BY	DATE
CLASSIFICATION <i>SC LL 25 PI 9</i>				SPECIFIC GRAVITY	
TEST NO.		<i>2060</i>	<i>4060</i>	<i>8060</i>	<i>4</i>
INITIAL MOISTURE %					
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf		<i>1.74</i>	<i>1.79</i>	<i>1.84</i>	
VOID RATIO		<i>.5104</i>	<i>.4715</i>	<i>.4291</i>	
PERMEABILITY COEF. <i>F.P.D.</i>		<i>.02443</i>	<i>.01039</i>	<i>.00343</i>	
PERCOLATION COEF					
$H/L$ DURING TEST					
TEST SPECIFICATIONS <i>Falling Head Perme.</i>					



## REMARKS

$e_0 = 0.801$   
Volume Change = 20.7%  
 $K$  at  $e_0 =$

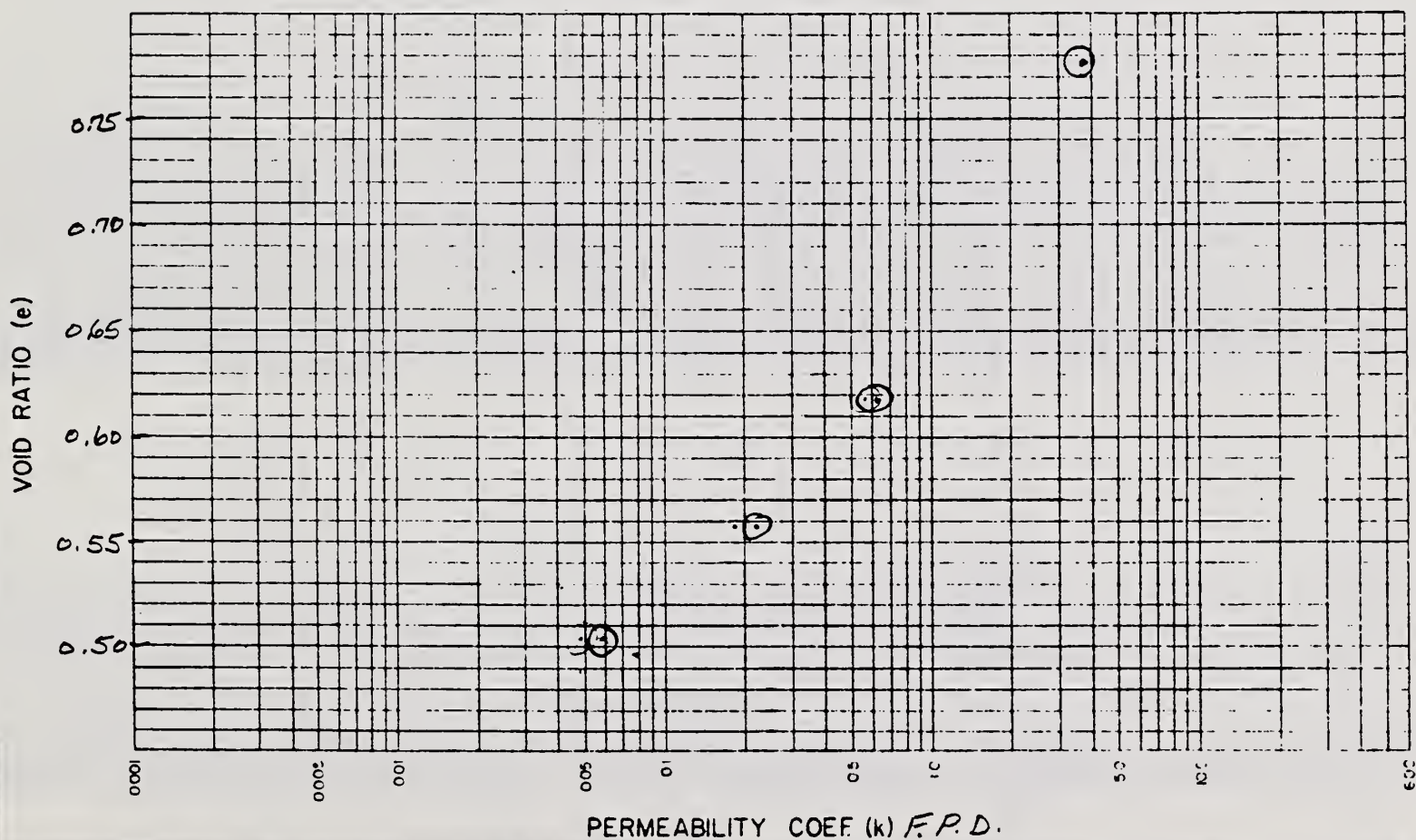


Test 2

SCS-ENG-127  
REV. 1-72

LITHOLOGY: 88C101

MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE WePP - Sverdrup - Morris, MN.				SAMPLE LOCATION	
FIELD SAMPLE NO		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE Compacted		TESTED AT SML, Lincoln	APPROVED BY		DATE
CLASSIFICATION SC LL 25 PI 9				SPECIFIC GRAVITY	
TEST NO	100	500	1000	2000	G <sub>s</sub> (-) #4
INITIAL MOISTURE %					G <sub>s</sub> (+) #4
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	1.48	1.62	1.69	1.75	G <sub>rn</sub> (Bulk) (+) #4
VOID RATIO	.7777	.6195	.5588	.5032	TEST SPECIFICATIONS Falling Head Perm
PERMEABILITY COEF F.P.D.	3.7722	.6268	.21954	.05891	
PERCOLATION COEF					
H <sub>1</sub> /L DURING TEST					



REMARKS

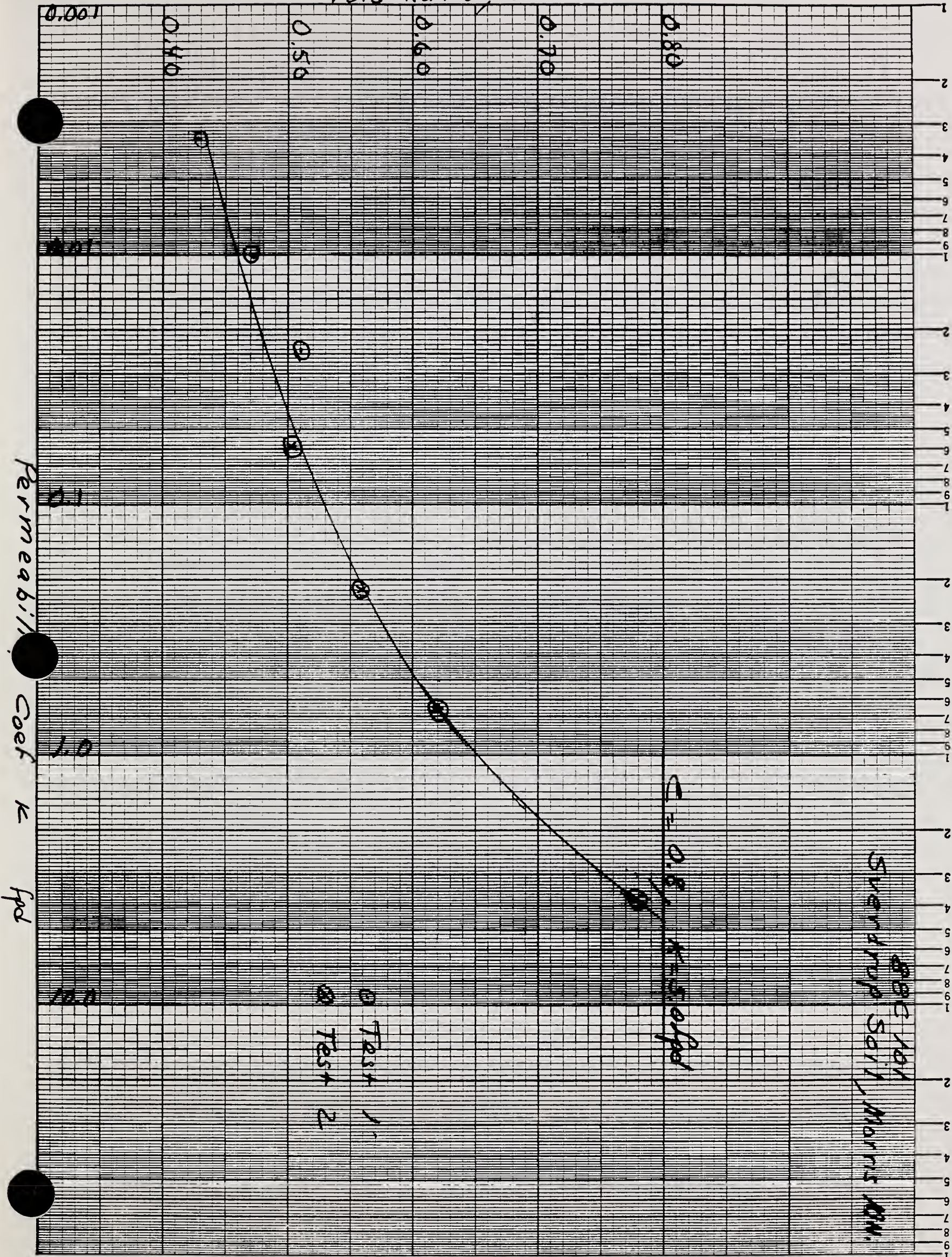
$$e_0 = 0.801$$







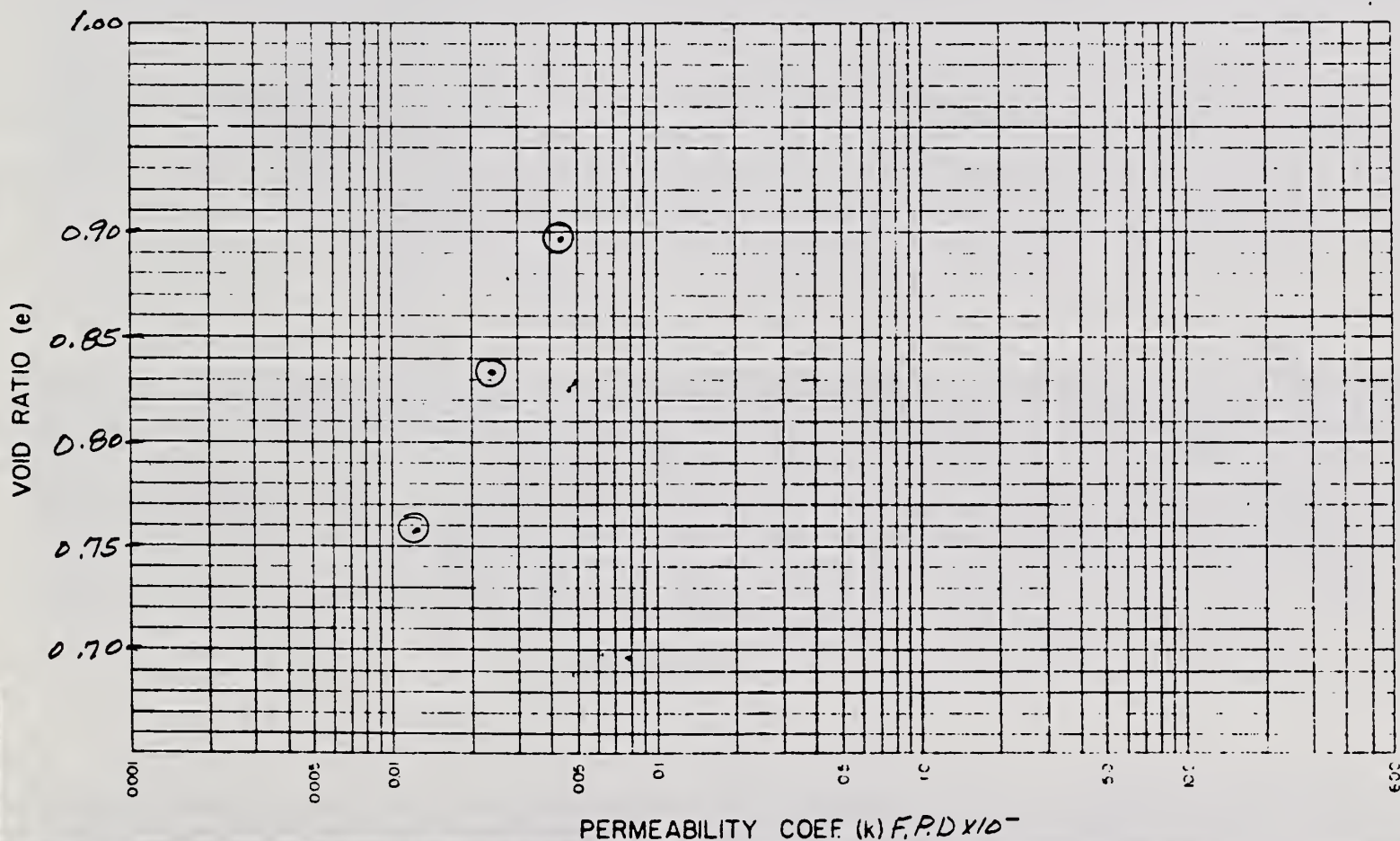
Void Ratio,  $e$







MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY			
PROJECT and STATE <b>WePP- Walla Walla - Pullman, WA.</b>				SAMPLE LOCATION			
FIELD SAMPLE NO.		DEPTH	GEOLOGIC ORIGIN				
TYPE OF SAMPLE <b>Compacted</b>		TESTED AT <b>SML, Lincoln</b>	APPROVED BY		DATE		
CLASSIFICATION <b>CL-ML LL 28 PI 4</b>				SPECIFIC GRAVITY			
TEST NO.		<b>2000</b>	<b>4000</b>	<b>8000</b>	<b>4</b>	$G_s (-)^{\#4}$	<b>2.65</b>
INITIAL MOISTURE %						$G_s (+)^{\#4}$	
DRY DENSITY $\square$ g/cc $\square$ pcf		<b>1.40</b>	<b>1.45</b>	<b>1.51</b>		$G_m(\text{Bulk})(+)^{\#4}$	
VOID RATIO		<b>.8969</b>	<b>.8320</b>	<b>.7589</b>		TEST SPECIFICATIONS <b>Falling Head Perm.</b>	
PERMEABILITY COEF $F.P.D.$		<b>.04369</b>	<b>.02458</b>	<b>.01389</b>			
PERCOLATION COEF							
$H/L$ DURING TEST							



REMARKS

$$e_0 = 1.12$$





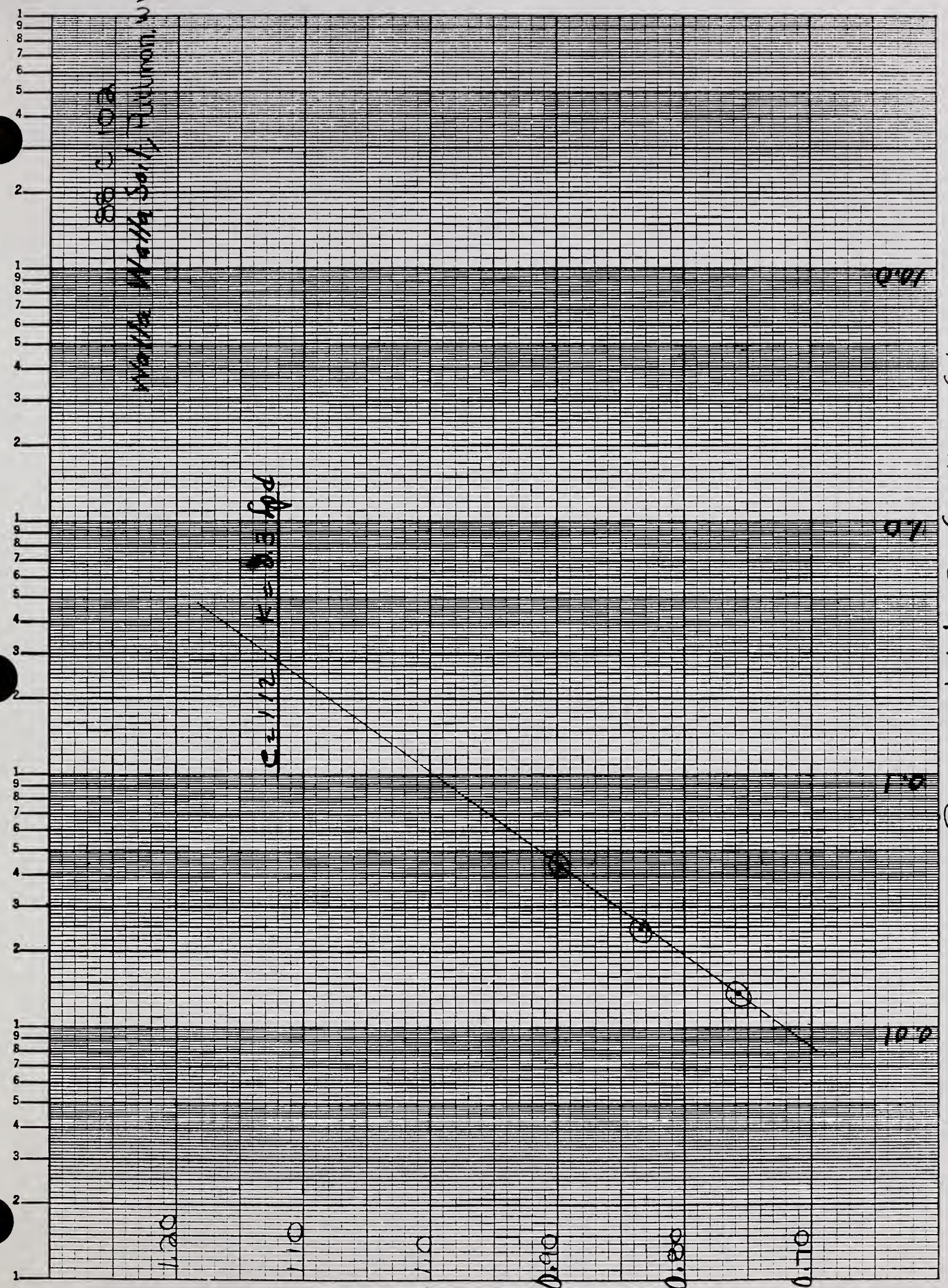


88 C 102  
 Walla Walla Soil, Pullman, WA

$C = 112$   $K = 83 \text{ gpd}$

Void Ratio,  $e$

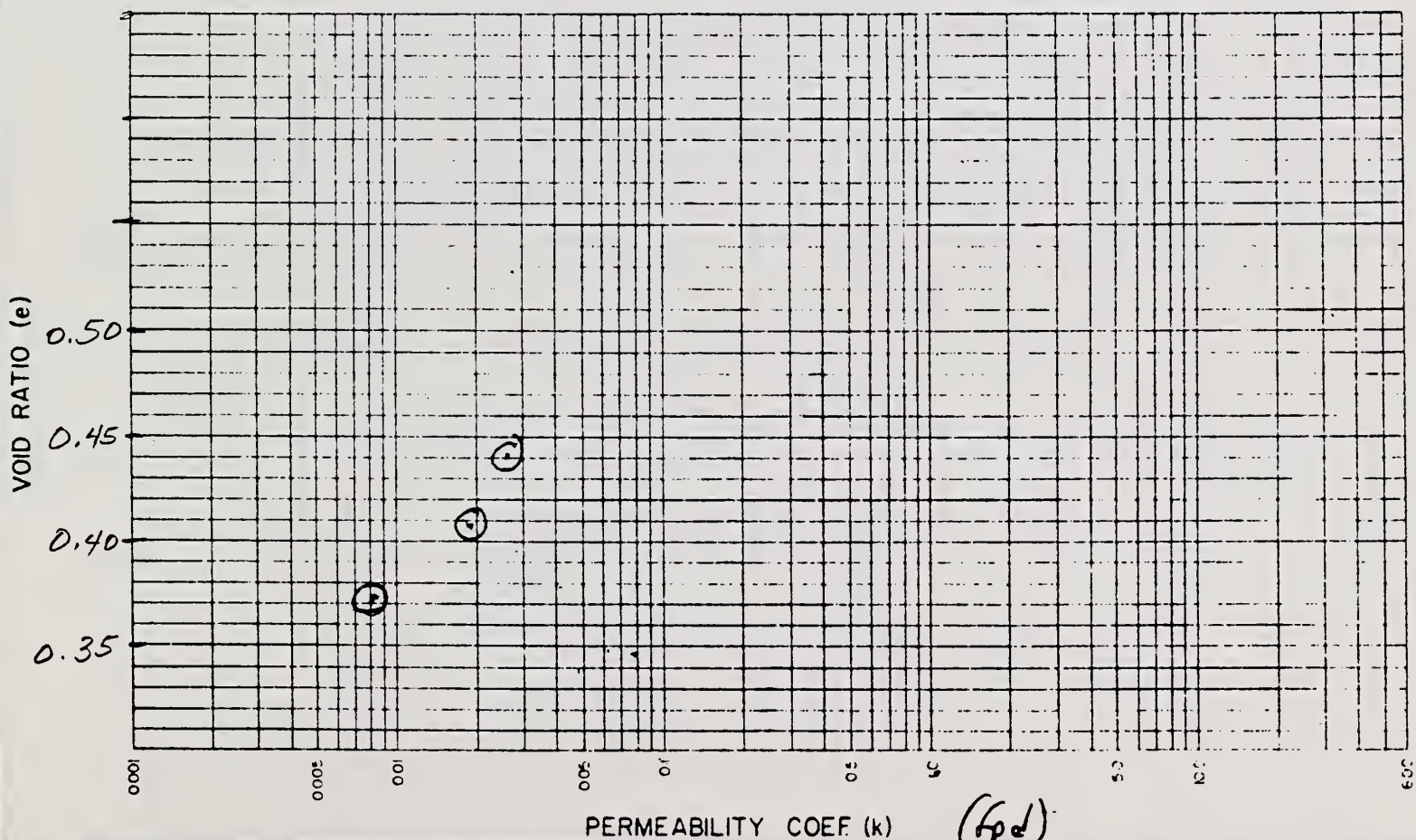
Permeability Coef.,  $K$  gpd







MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY			
PROJECT and STATE <i>W. E. P. P. Whitney - Fresno, CA.</i>			SAMPLE LOCATION				
FIELD SAMPLE NO.		DEPTH	GEOLOGIC ORIGIN				
TYPE OF SAMPLE <i>Compacted</i>		TESTED AT <i>SML, Lincoln</i>	APPROVED BY		DATE		
CLASSIFICATION <i>No Ne Plastic SM</i> LL <u>    </u> PI <u>    </u>				SPECIFIC GRAVITY			
TEST NO		<i>2060</i>	<i>4060</i>	<i>8060</i>	<i>4</i>	$G_s (-)^{\#4}$	<i>2.67</i>
INITIAL MOISTURE %						$G_s (+)^{\#4}$	
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf		<i>1.85</i>	<i>1.90</i>	<i>1.95</i>		$G_{TH}(\text{Bulk})(+)^{\#4}$	
VOID RATIO		<i>.4402</i>	<i>.4080</i>	<i>.3709</i>		TEST SPECIFICATIONS <i>Falling Head Perm.</i>	
PERMEABILITY COEF <i>F.P.D.</i>		<i>.02646</i>	<i>.01906</i>	<i>.00836</i>			
PERCOLATION COEF							
$H/L$ DURING TEST							



## REMARKS

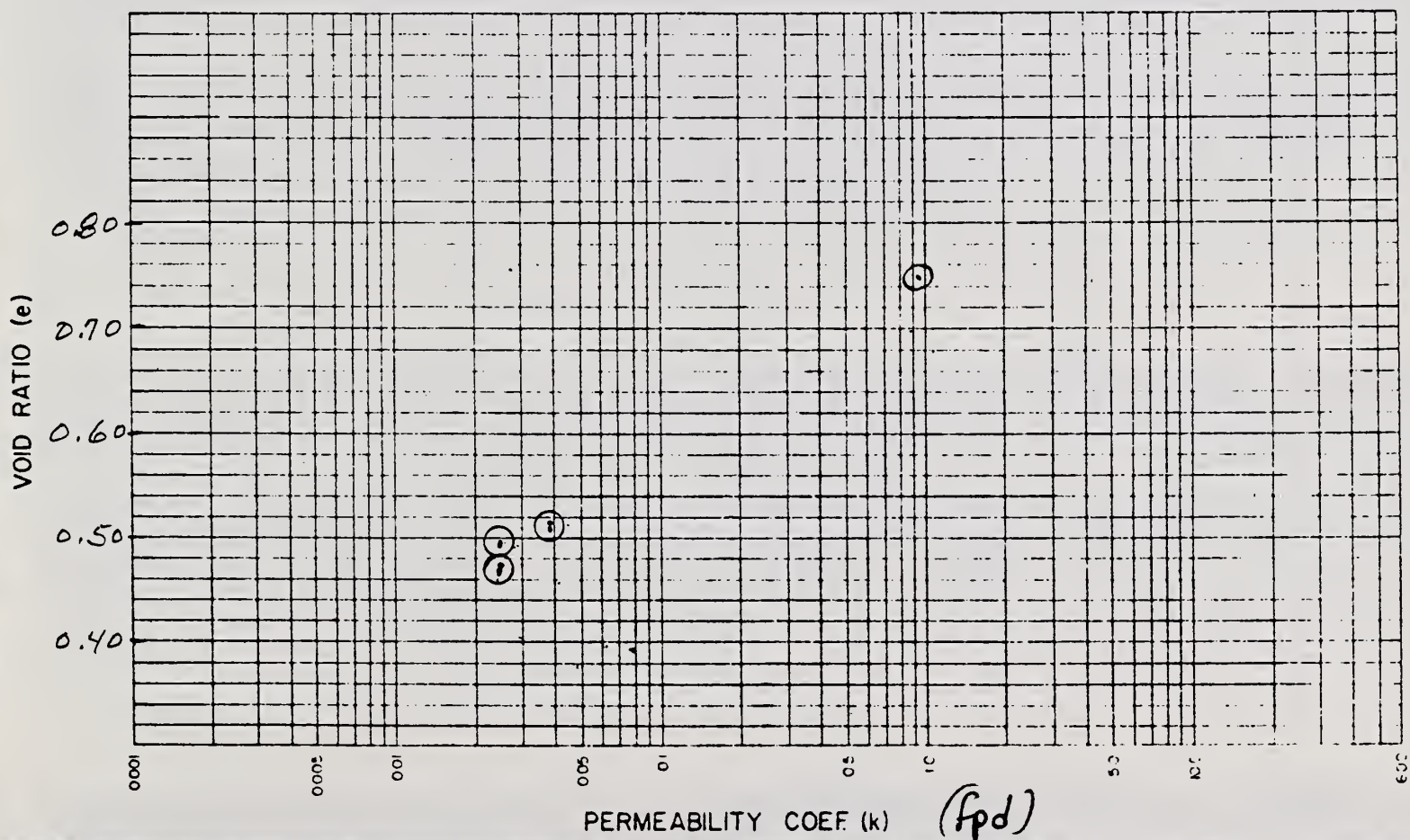
 $e_0 = 0.734$ 

Volume Change - 20.9%





MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE WePP - Fresno, CA.				SAMPLE LOCATION	
FIELD SAMPLE NO		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE Compacted		TESTED AT SML, Lincoln	APPROVED BY		DATE
CLASSIFICATION Non-plastic SM LL ____ PI ____				SPECIFIC GRAVITY	
TEST NO	100	500	1000	2000	$G_s (-)^{\#4}$ 2.67
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	1.53	1.76	1.79	1.81	$G_{m(Bulk)}(+)^{\#4}$
VOID RATIO	.7447	.5167	.4950	.4737	TEST SPECIFICATIONS Falling Head Perm.
PERMEABILITY COEF F.P.D.	.94641	.03901	.02547	.02579	
PERCOLATION COEF					
$H/L$ DURING TEST					



REMARKS

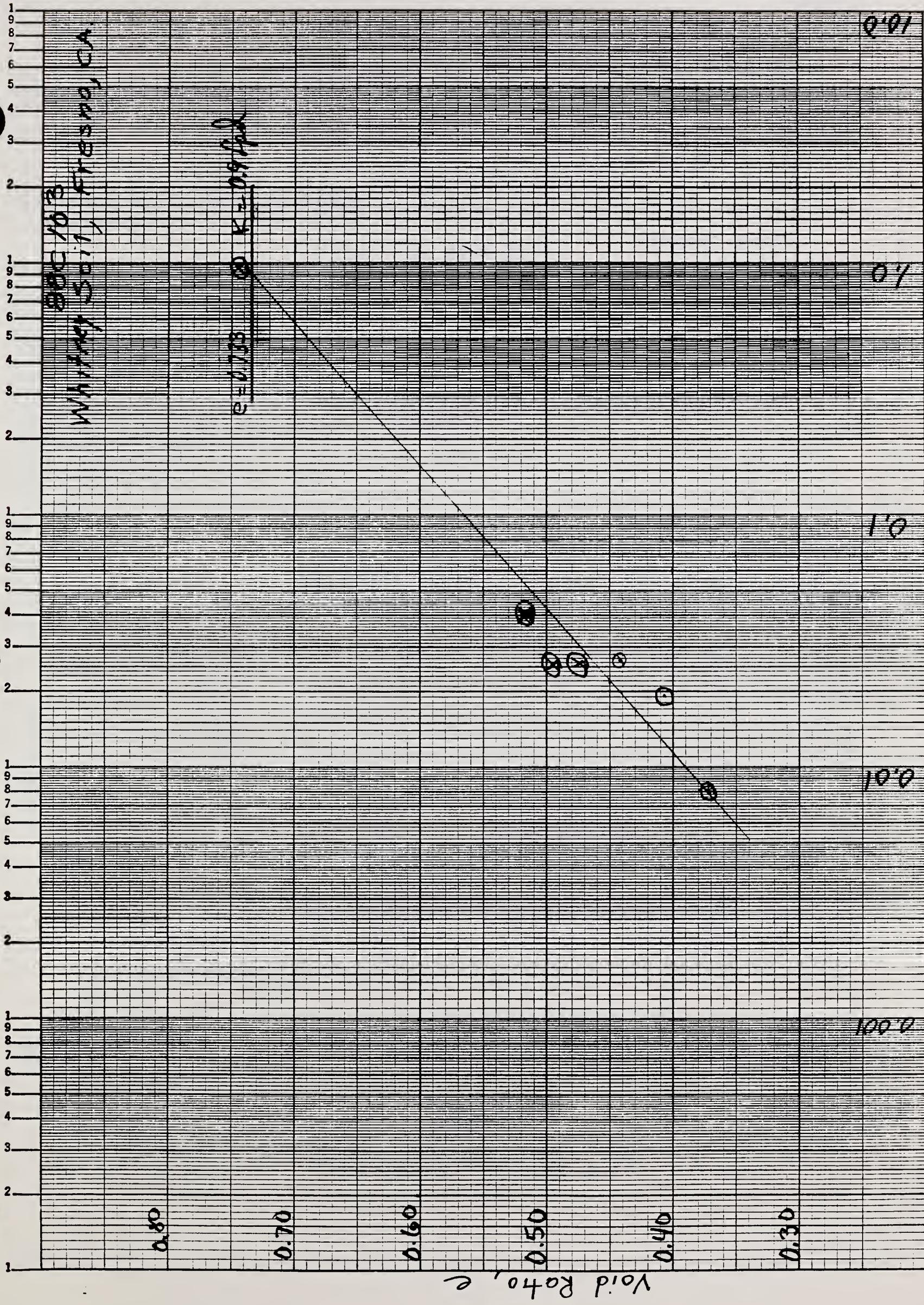
$$e_o = 0.733$$





Whitney Soil, Fresno, CA.  
 SEC 103

$e = 0.733$   $K = 0.9 \text{ fad}$

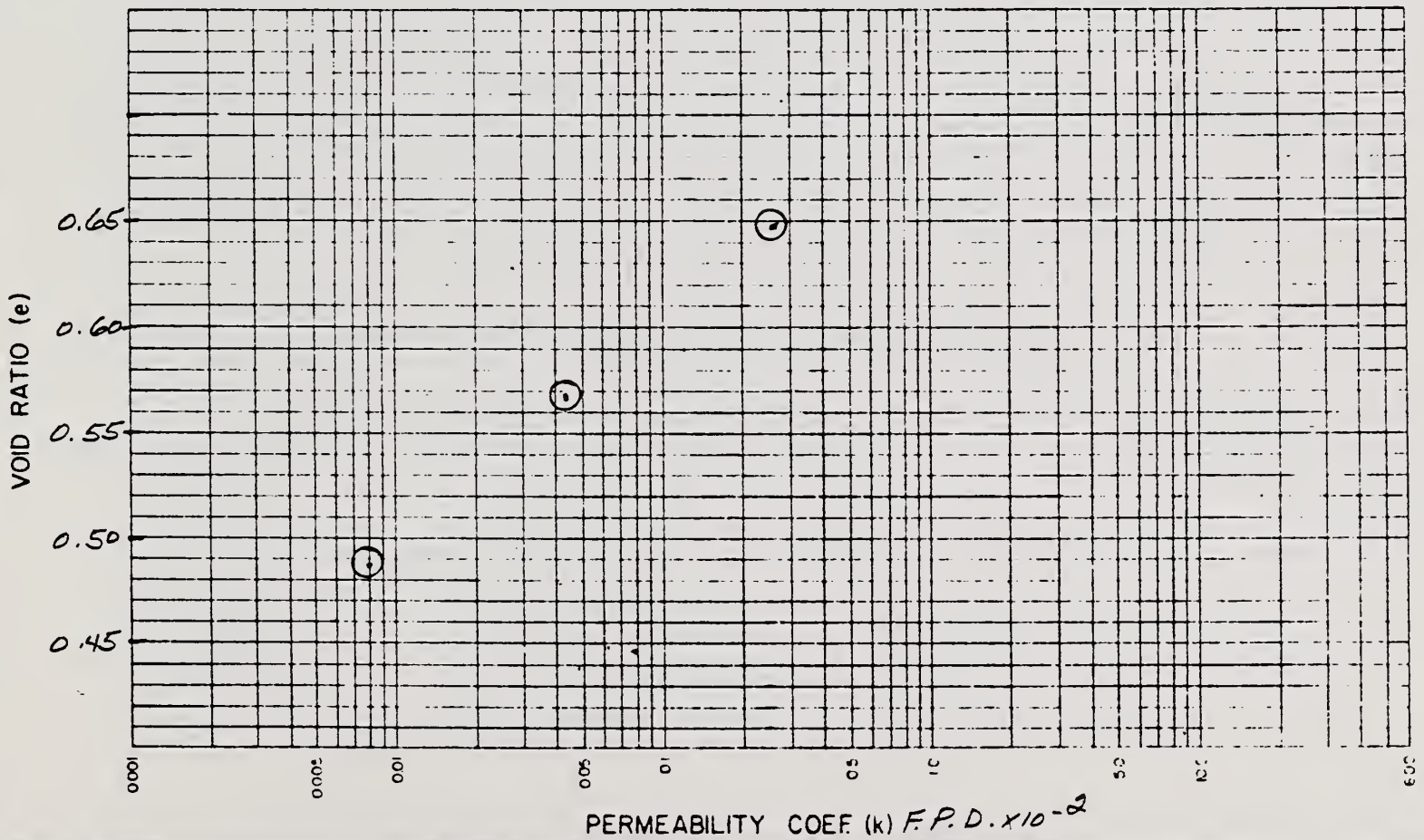


Permeability Coef,  $K$  (fad)





<b>MATERIALS TESTING REPORT</b>		<b>U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE</b>		<b>SOIL PERMEABILITY</b>	
PROJECT and STATE <i>WePP - Williams - McClusky, ND.</i>				SAMPLE LOCATION	
FIELD SAMPLE NO		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE <i>Compacted</i>		TESTED AT <i>SML, Lincoln</i>	APPROVED BY		DATE
CLASSIFICATION <i>CL LL 37 PI 19</i>				SPECIFIC GRAVITY	
TEST NO.	<i>2000</i>	<i>4080</i>	<i>8000</i>	<i>4</i>	$G_s (-)^{\#4}$
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	<i>1.57</i>	<i>1.65</i>	<i>1.74</i>		$G_m (Bulk)(+)^{\#4}$
VOID RATIO	<i>.6480</i>	<i>.5685</i>	<i>.4865</i>		TEST SPECIFICATIONS <i>Falling Head Perm.</i>
PERMEABILITY COEF F.P.D.	<i>.00279</i>	<i>.00043</i>	<i>.00008</i>		
PERCOLATION COEF					
$H/L$ DURING TEST					



REMARKS

$e_0 = 1.233$   
Volume change = 33.4 %

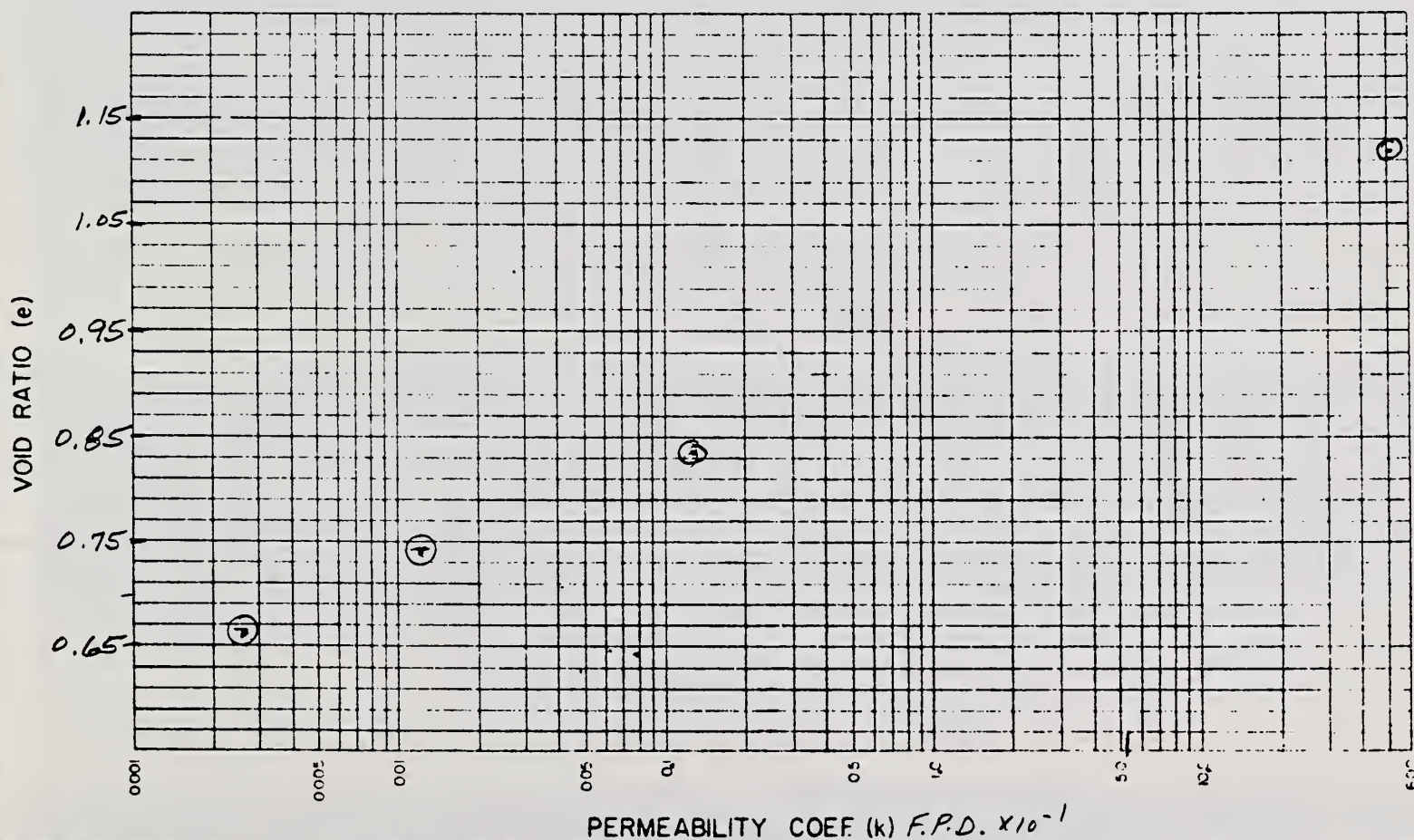


Test 2

SCS-ENG-127  
REV. 1-72

LABORATORY NO. BBC 104

MATERIALS TESTING REPORT		U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE		SOIL PERMEABILITY	
PROJECT and STATE WePP - Williams - McClusky, ND.				SAMPLE LOCATION	
FIELD SAMPLE NO		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE Compacted		TESTED AT SML, Lincoln	APPROVED BY		DATE
CLASSIFICATION CL LL 37 PI 19				SPECIFIC GRAVITY	
TEST NO	100	580	1000	2000	G <sub>s</sub> (-) #4
INITIAL MOISTURE %					G <sub>s</sub> (+) #4
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	1.22	1.41	1.49	1.56	G <sub>m</sub> (Bulk) (+) #4
VOID RATIO	1.1244	.8343	.7421	.6633	TEST SPECIFICATIONS Falling Head Perm.
PERMEABILITY COEF F.P.D.	5.0753	.01275	.00134	.00027	
PERCOLATION COEF					
H <sub>L</sub> DURING TEST					



REMARKS

$$e_0 = 1.233$$





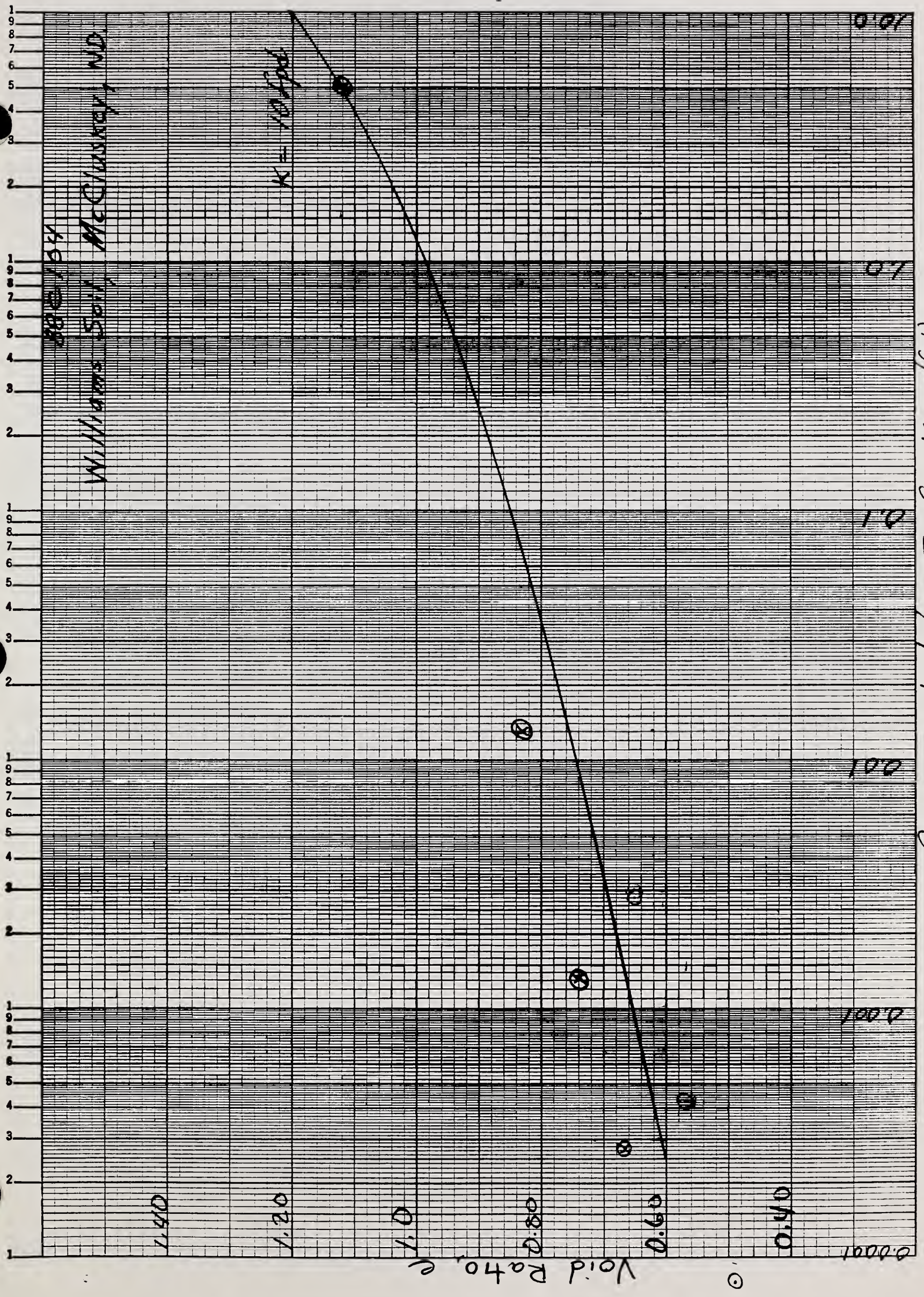


Williams Soil, McCluskey, ND

2880, 104

$K = 10 \text{ fpm}$

Permeability Coef.  $K$  (fpm)



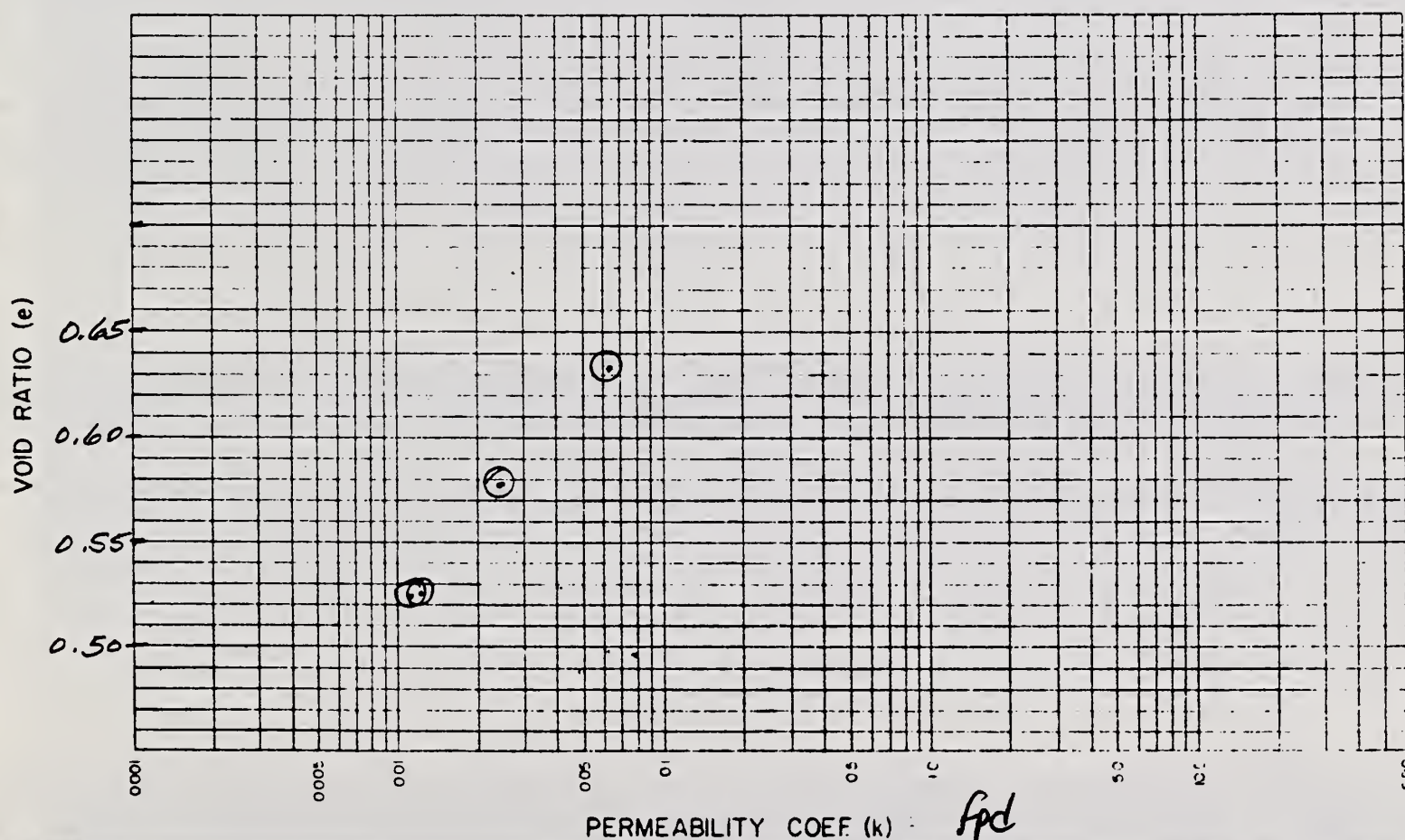




MATERIALS  
TESTING REPORTU. S. DEPARTMENT of AGRICULTURE  
SOIL CONSERVATION SERVICE

## SOIL PERMEABILITY

PROJECT and STATE <i>We PP- WOODWARD OK</i>				SAMPLE LOCATION	
FIELD SAMPLE NO		DEPTH	GEOLOGIC ORIGIN		
TYPE OF SAMPLE <i>Compacted</i>		TESTED AT <i>SML, Lincoln</i>		APPROVED BY	DATE
CLASSIFICATION LL ____ PI ____				SPECIFIC GRAVITY	
TEST NO	<i>2000</i>	<i>4000</i>	<i>8000</i>	<i>4</i>	$G_s (-)^{\#4}$ <i>2.61</i>
INITIAL MOISTURE %					$G_s (+)^{\#4}$
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	<i>1.60</i>	<i>1.65</i>	<i>1.71</i>		$G_m (Bulk)(+)^{\#4}$
VOID RATIO	<i>.6339</i>	<i>.5783</i>	<i>.5245</i>		TEST SPECIFICATIONS <i>Falling Head Perm.</i>
PERMEABILITY COEF <i>F.P.D.</i>	<i>.06220</i>	<i>.02516</i>	<i>.01232</i>		
PERCOLATION COEF					
$H/L$ DURING TEST					



## REMARKS

$$e_0 = 0.851$$

Volume Change - 17.6%





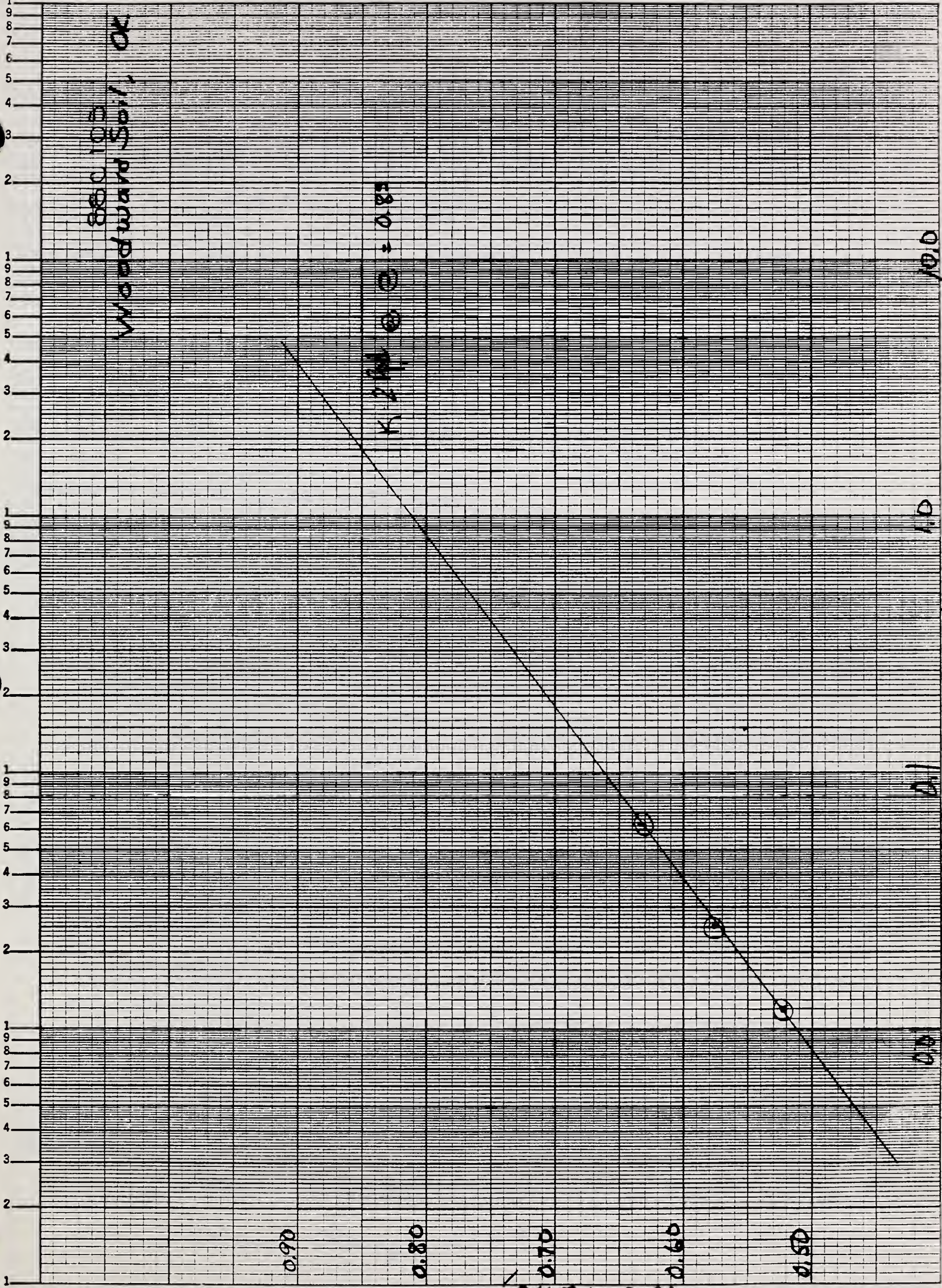


800 105  
Woodward Soil, OK

$K = 2.7 \times 10^{-3} \text{ cm} = 0.85$

Void Ratio,  $e$

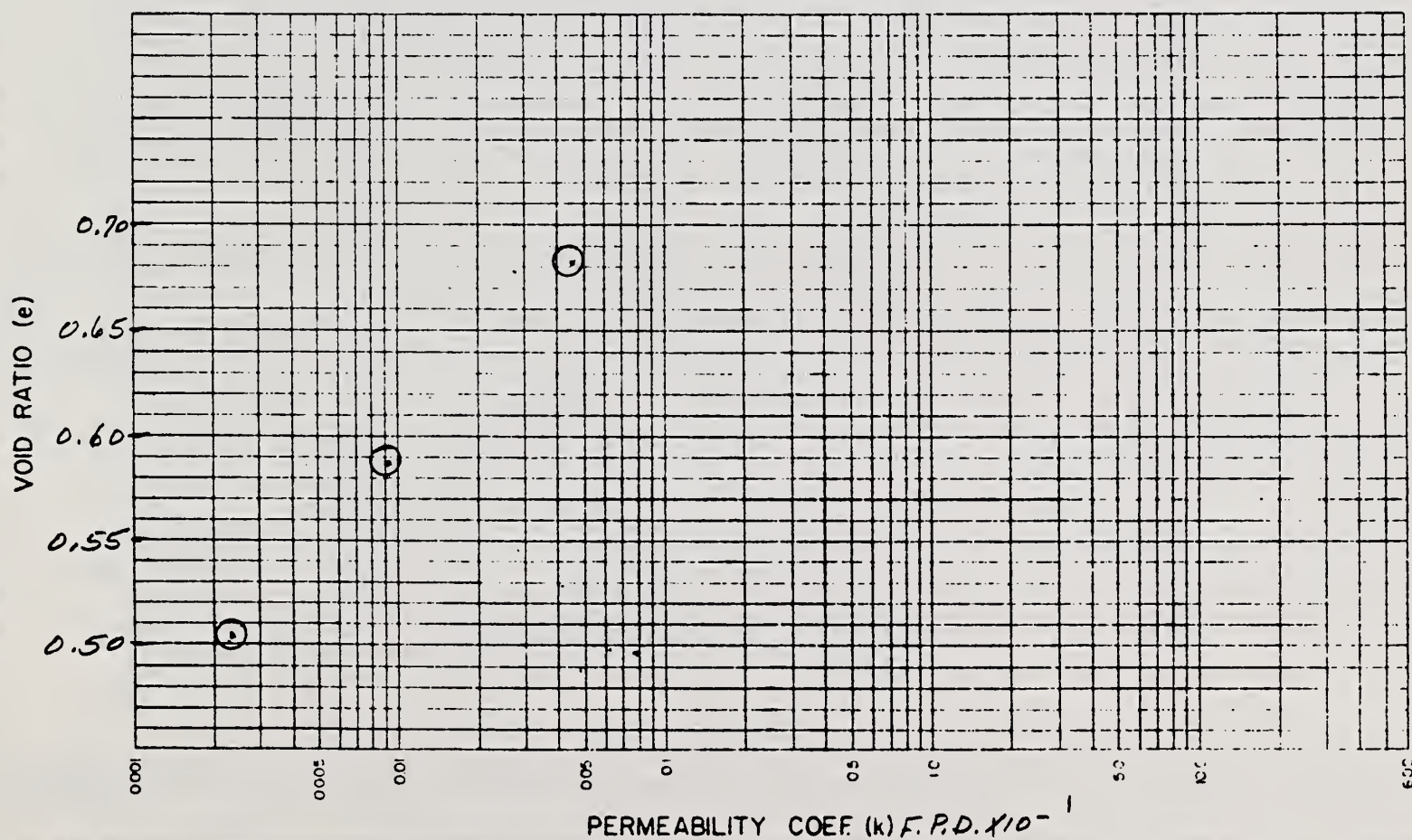
Permeability Coef.  $K$







<b>MATERIALS TESTING REPORT</b>		<b>U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE</b>		<b>SOIL PERMEABILITY</b>			
PROJECT and STATE We PP- Z A H L ND.				SAMPLE LOCATION			
FIELD SAMPLE NO		DEPTH	GEOLOGIC ORIGIN				
TYPE OF SAMPLE Compacted		TESTED AT SML - Lincoln		APPROVED BY	DATE		
CLASSIFICATION LL ____ PI ____				SPECIFIC GRAVITY			
TEST NO		2000	4000	8000	4	$G_s (-)^{\#4}$	2.58
INITIAL MOISTURE %						$G_s (+)^{\#4}$	
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf		1.53	1.63	1.72		$G_{TH} (Bulk)(+)^{\#4}$	
VOID RATIO		.6803	.5853	.5023		TEST SPECIFICATIONS Falling Head Perm.	
PERMEABILITY COEF. F.P.D.		.00466	.00091	.00024			
PERCOLATION COEF							
$H/L$ DURING TEST							



REMARKS

$e_0 = 1.064$   
Volume Change = 27.2%





MATERIALS  
TESTING REPORTU. S. DEPARTMENT of AGRICULTURE  
SOIL CONSERVATION SERVICE

## SOIL PERMEABILITY

PROJECT and STATE

We PP- Zahl- North Dakota

SAMPLE LOCATION

FIELD SAMPLE NO

DEPTH

GEOLOGIC ORIGIN

TYPE OF SAMPLE

Compacted

TESTED AT

SML, Lincoln

APPROVED BY

DATE

CLASSIFICATION

CL LL 31 PI 13

SPECIFIC GRAVITY

TEST NO	100	500	1000	2000
INITIAL MOISTURE %				
DRY DENSITY <input type="checkbox"/> g/cc <input type="checkbox"/> pcf	1.32	1.47	1.54	1.60
VOID RATIO	.9568	.7582	.6802	.6129
PERMEABILITY COEF F.P.D.	1.2669	.04477	.00608	.00149
PERCOLATION COEF				
H <sub>1</sub> /L DURING TEST				

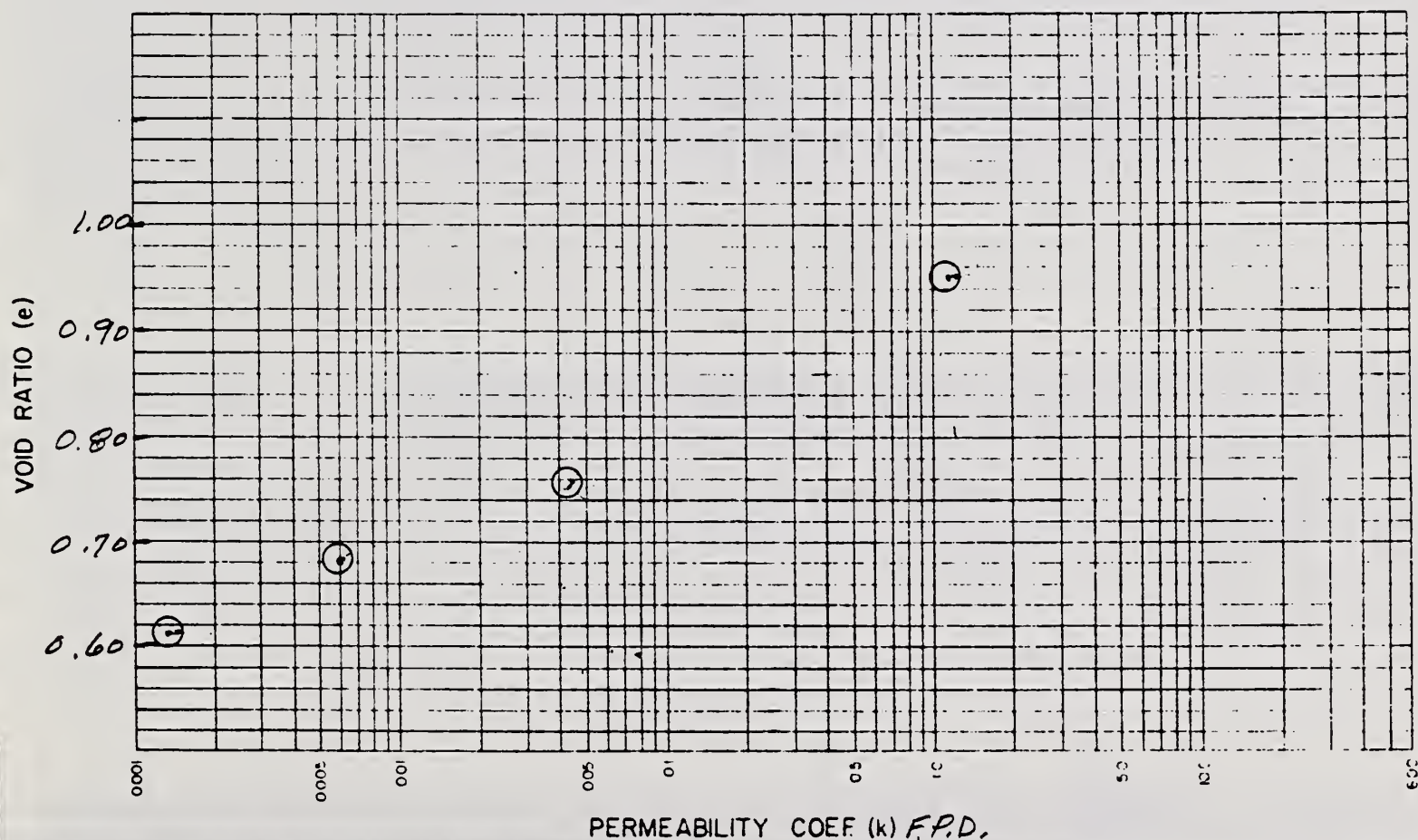
G<sub>s</sub> (-) #4

2.58

G<sub>s</sub> (+) #4G<sub>m</sub>(Bulk)(+) #4

TEST SPECIFICATIONS

Falling Head Perm.



REMARKS

 $e_0 = 1.064$





88 C 106  
 ZACH Soil,

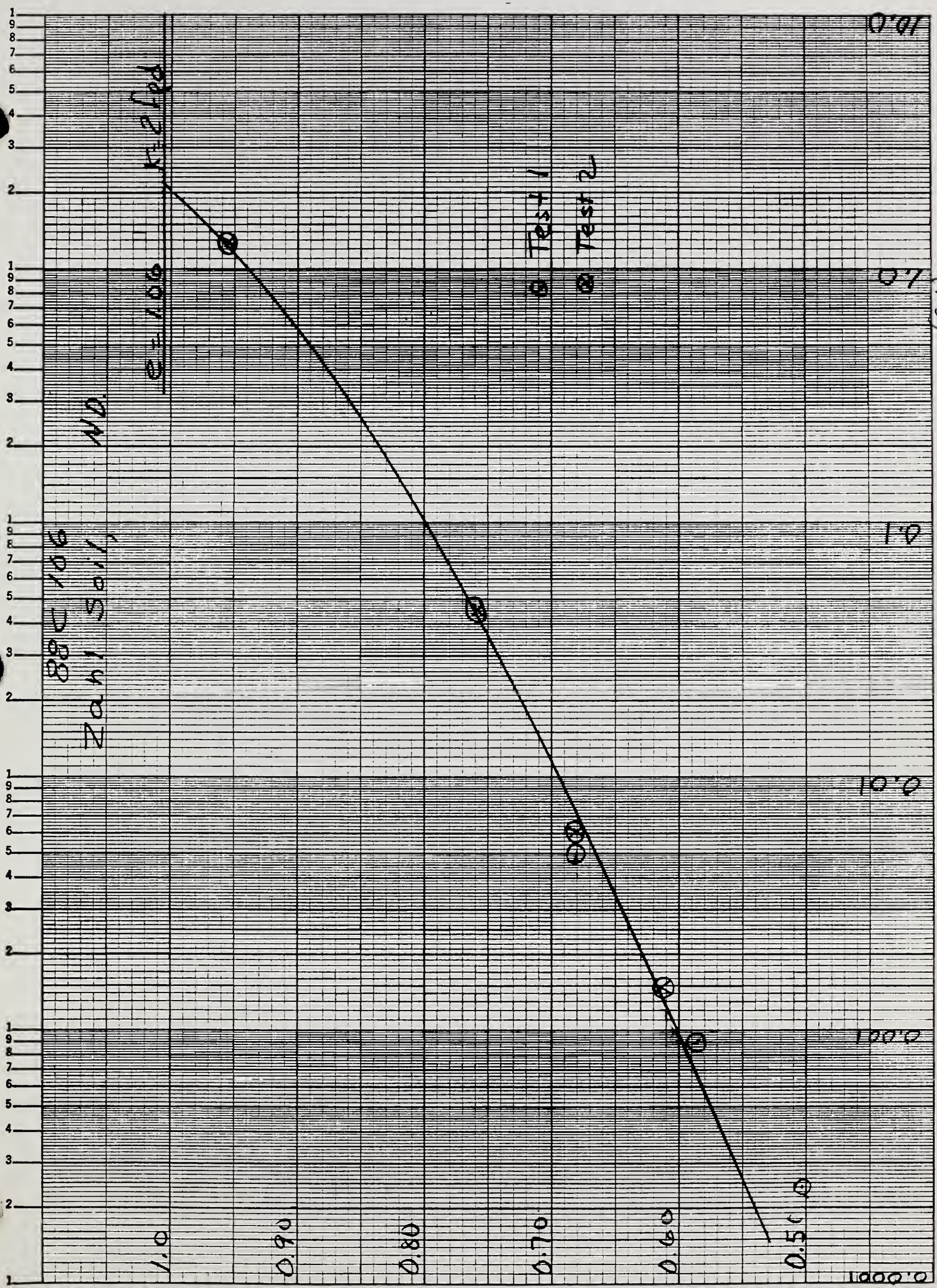
NO.

$e = 1.06$   
 $K = 2 \text{ fgd}$

Test 1  
 Test 2

Void Ratio,  $e$

Permeability Coef.  $K$  (fgd)







Effect of Conductivity of Eroding Water on Critical Shear Stress



Corn Dunigan:

Here are the WEPP water samples you  
had requested and how they were made  
up. We approximated the actual divalent /  
monovalent cation ratio with  $\text{Ca}^{++}$  and  $\text{Na}^+$   
in the chloride form. <sup>The ratio</sup> ~~of which~~ is an important factor  
in the ability of these waters to ~~be~~ disperse or  
flocculate soil colloids.

Because we approximated the actual system,  
which contains some  $\text{Mg}^{++}$  and  $\text{SO}_4^-$  with neutral  
salts that don't have the propensity for  
ion-pairing that  $\text{Mg}^{++}$  and  $\text{SO}_4^-$  do, the  
measured conductivity of the artificial water  
samples is slightly greater than that of the  
actual water, but not by a significant





amount (see the attached data sheets). It is  
the same for a ~~theoretical~~<sup>solution</sup> of that  
composition however.

<u>Sample #</u>	<u>EC mmhos/cm</u>		<u>Original water sample</u>
	<u>Theoretical</u>	<u>Actual</u>	
87T 7455	0.33	0.37	0.28
87T 7458	1.48	1.48	1.02
87P 4000	0.62	0.62	0.55
87T 7381	3.6	3.7	3.01

Terry Sobehi, Fuel Scientist, NSSC.

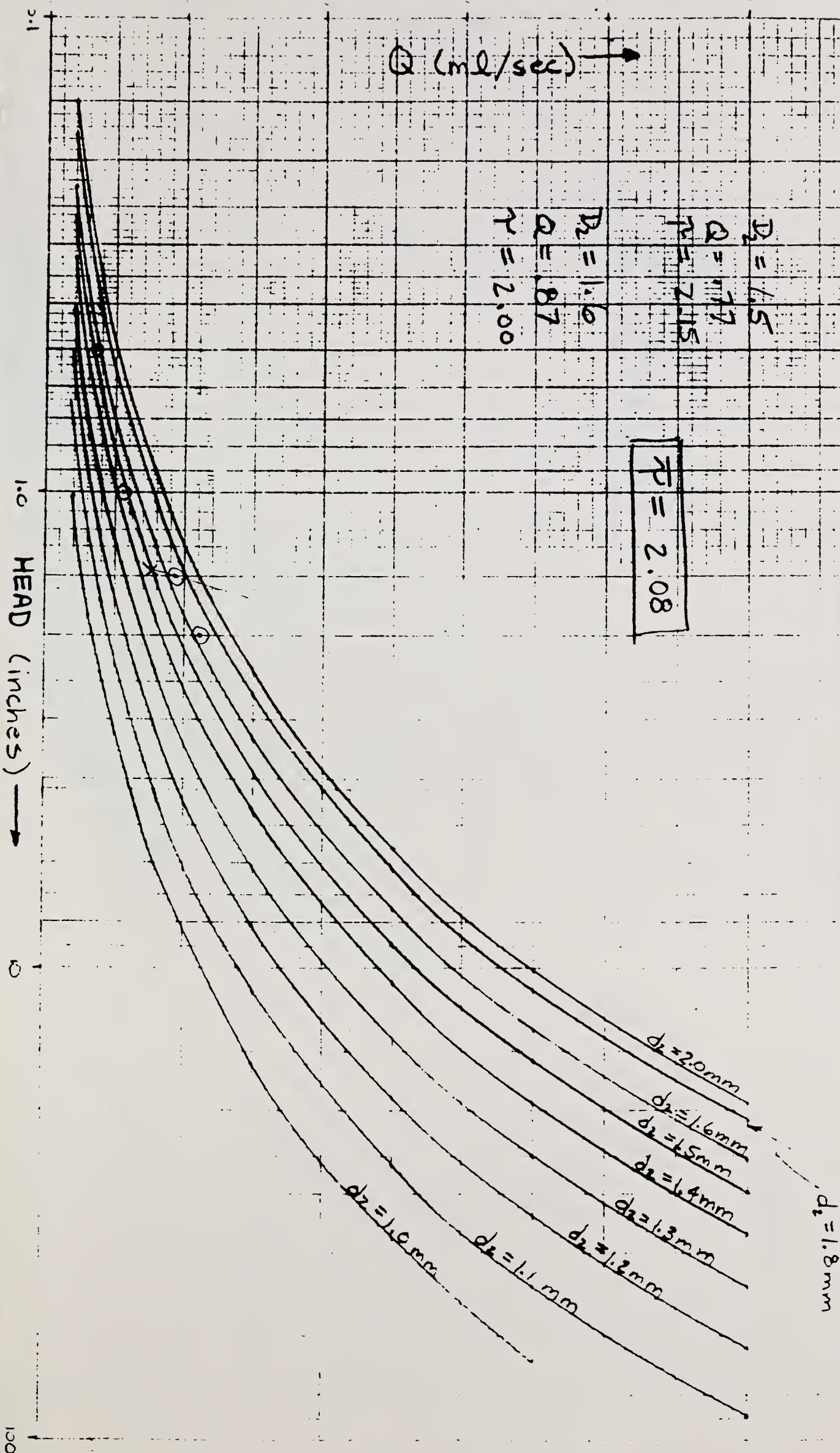


Barnes Soil

Distilled Water

# FLOW VERSUS HEAD FOR VARIOUS PINHOLE DIAMETERS

(LAMINAR FLOW ASSUMED)





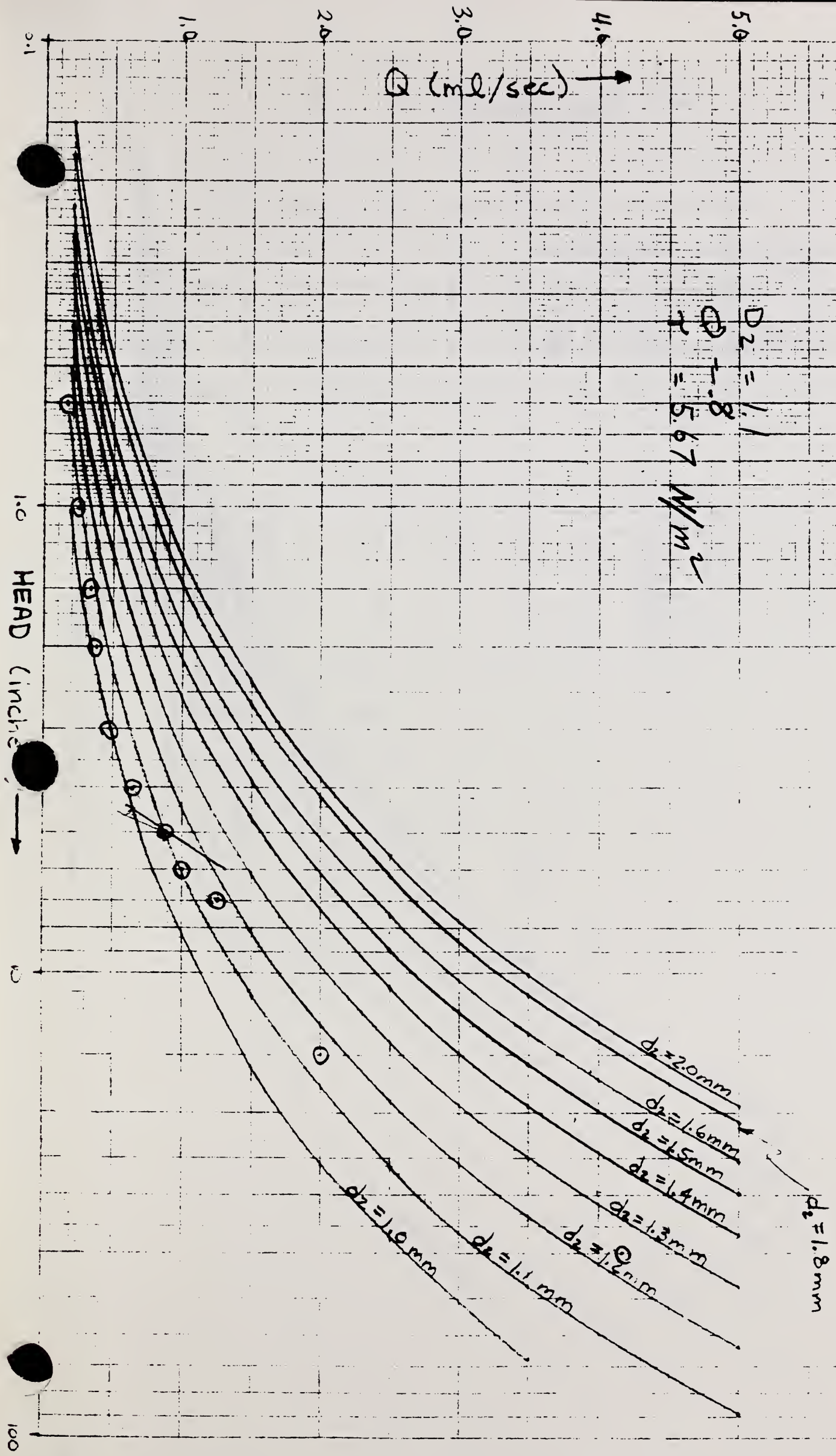


Barnes Soil ND

88C 92  
Field Trial Water

# FLOW VERSUS HEAD FOR VARIOUS PINHOLE DIAMETERS

(LAMINAR FLOW ASSUMED)



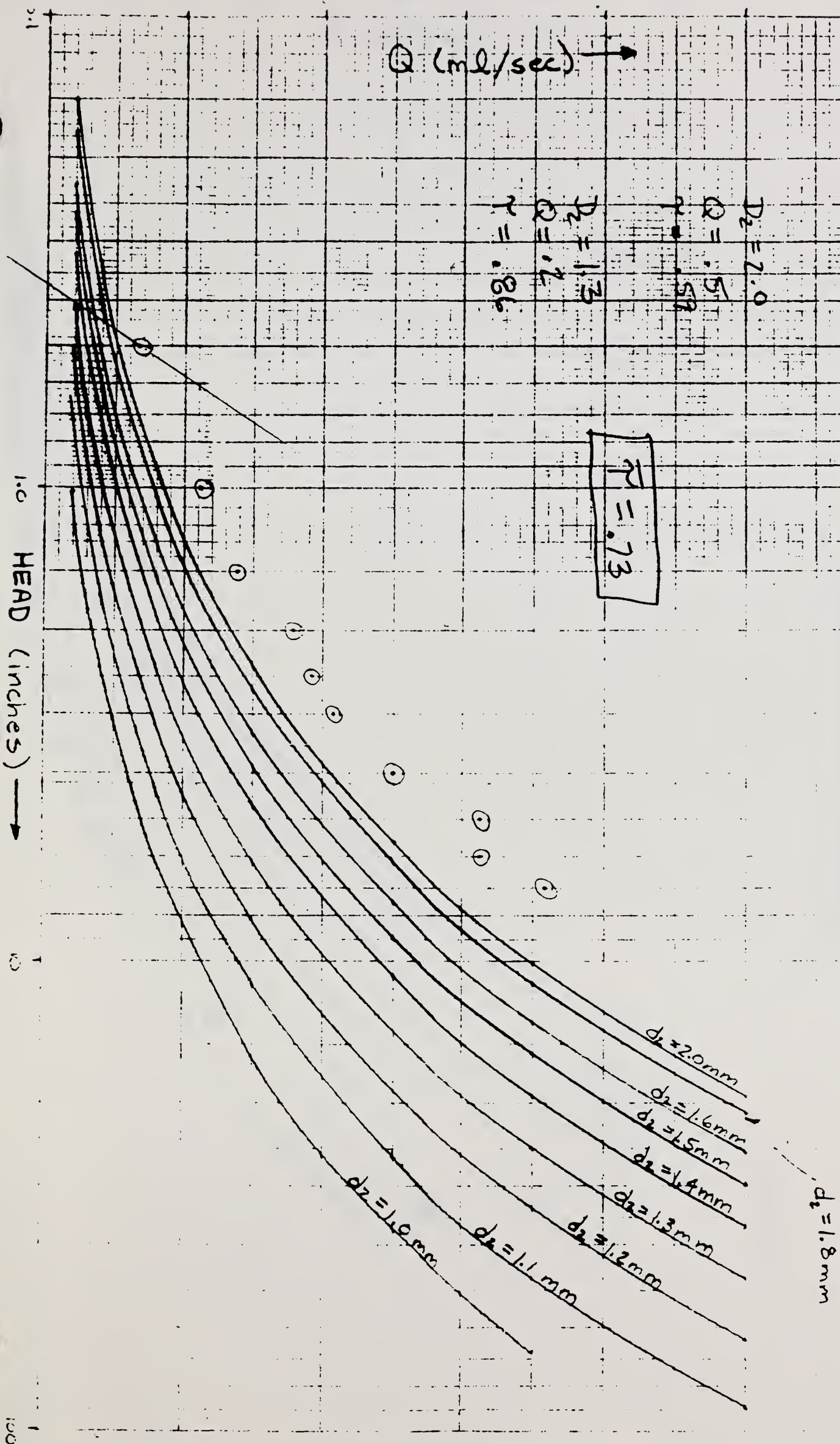


Keith Soil

Distilled Water

## FLOW VERSUS HEAD FOR VARIOUS PINHOLE DIAMETERS

(LAMINAR FLOW ASSUMED)







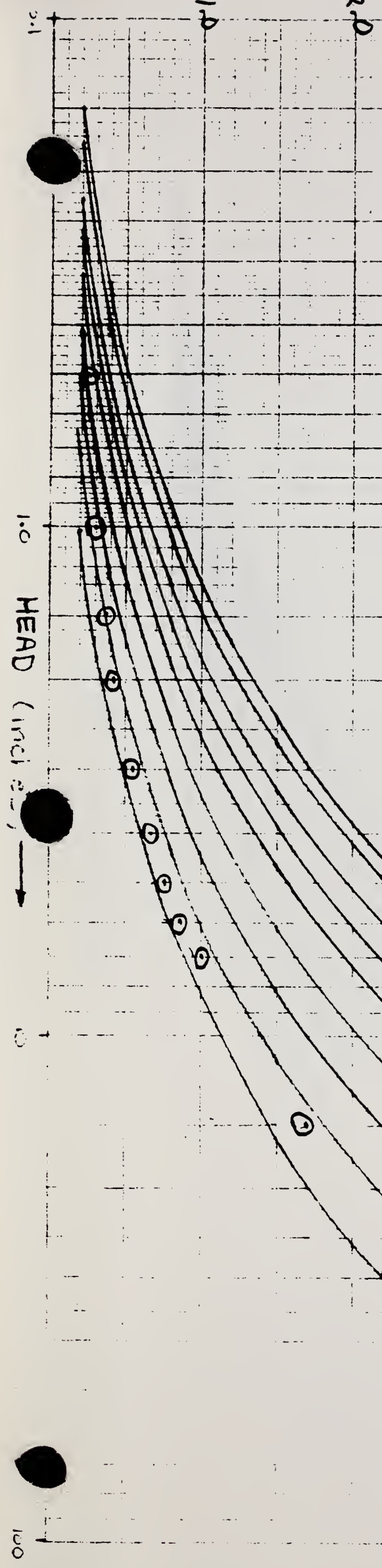
Keith Soil

88C95  
Field Trial Water

# FLOW VERSUS HEAD FOR VARIOUS PINHOLE DIAMETERS (LAMINAR FLOW ASSUMED)

$D_2 = 1.1$   
 $Q = 3.0$   
 $\tau = 2.126 \text{ N/m}^2$

$Q \text{ (ml/sec)}$





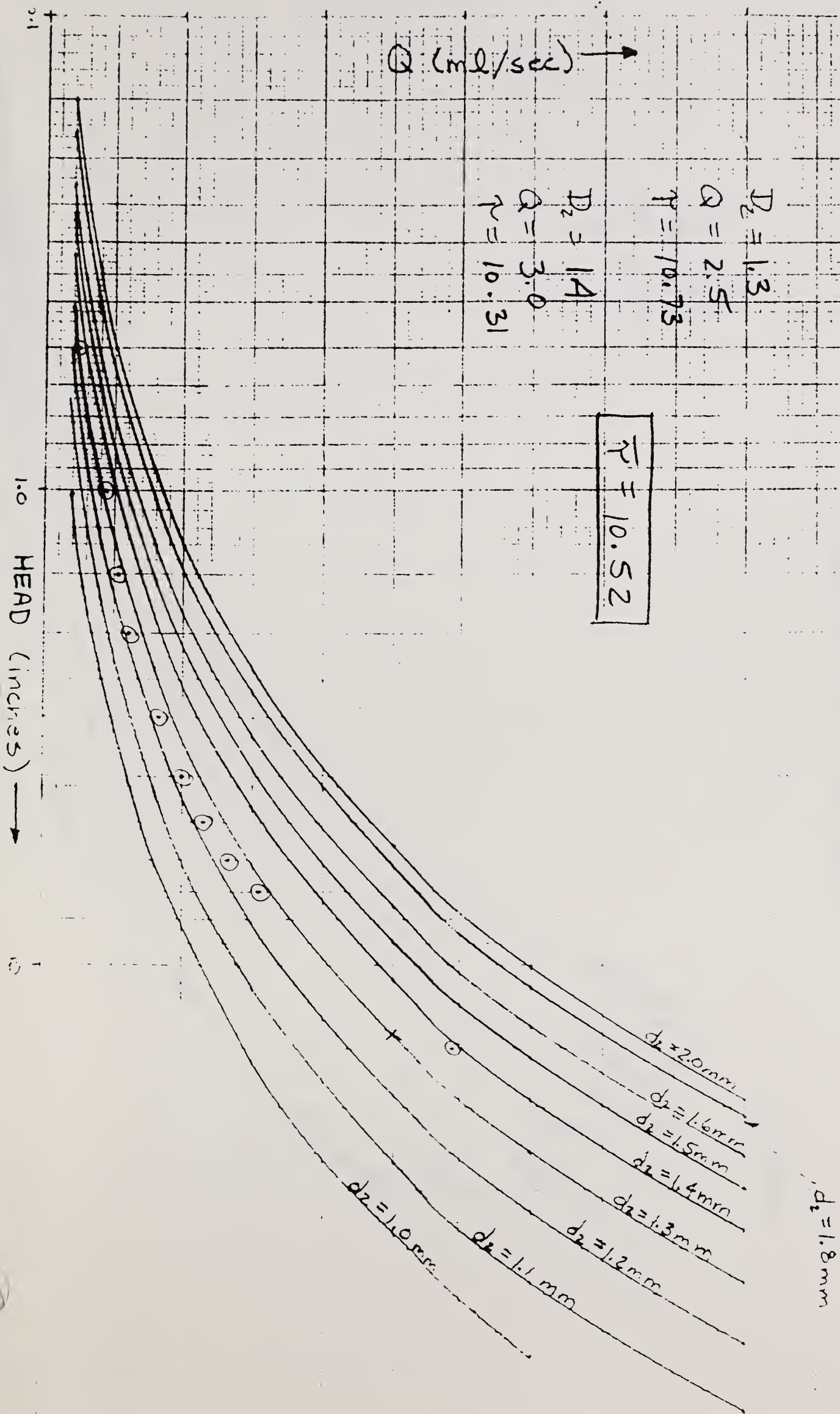
Los Banos Soil

68C 96

Distilled Water

# FLOW VERSUS HEAD FOR VARIOUS PINHOLE DIAMETERS

(LAMINAR FLOW ASSUMED)







Los Banos So, I

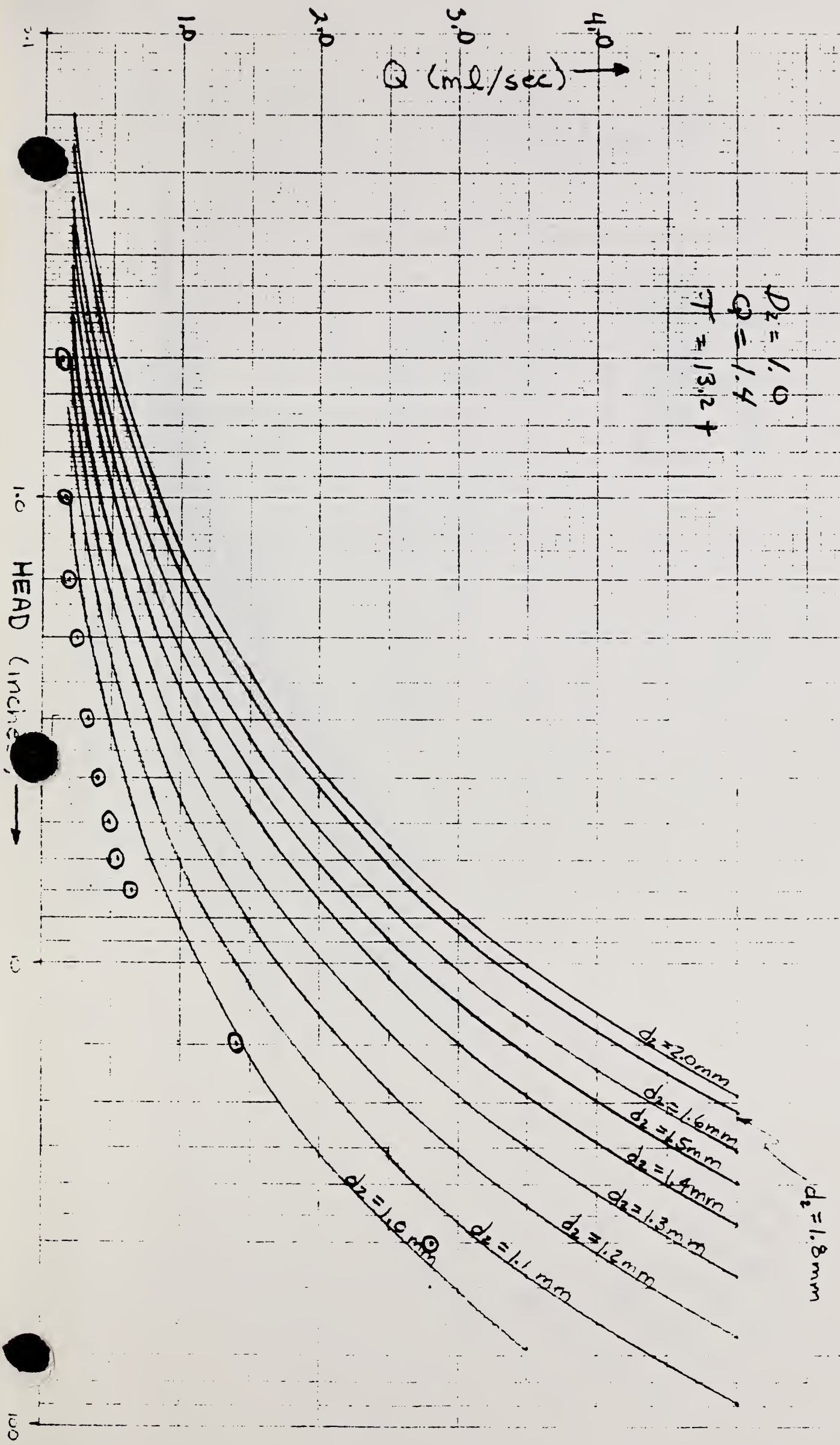
88C96  
Field Trial Water

# FLOW VERSUS HEAD FOR VARIOUS PINHOLE DIAMETERS

(LAMINAR FLOW ASSUMED)

$D_2 = 1.0$   
 $Q = 1.4$   
 $T = 13.2 +$

$Q$  (ml/sec)





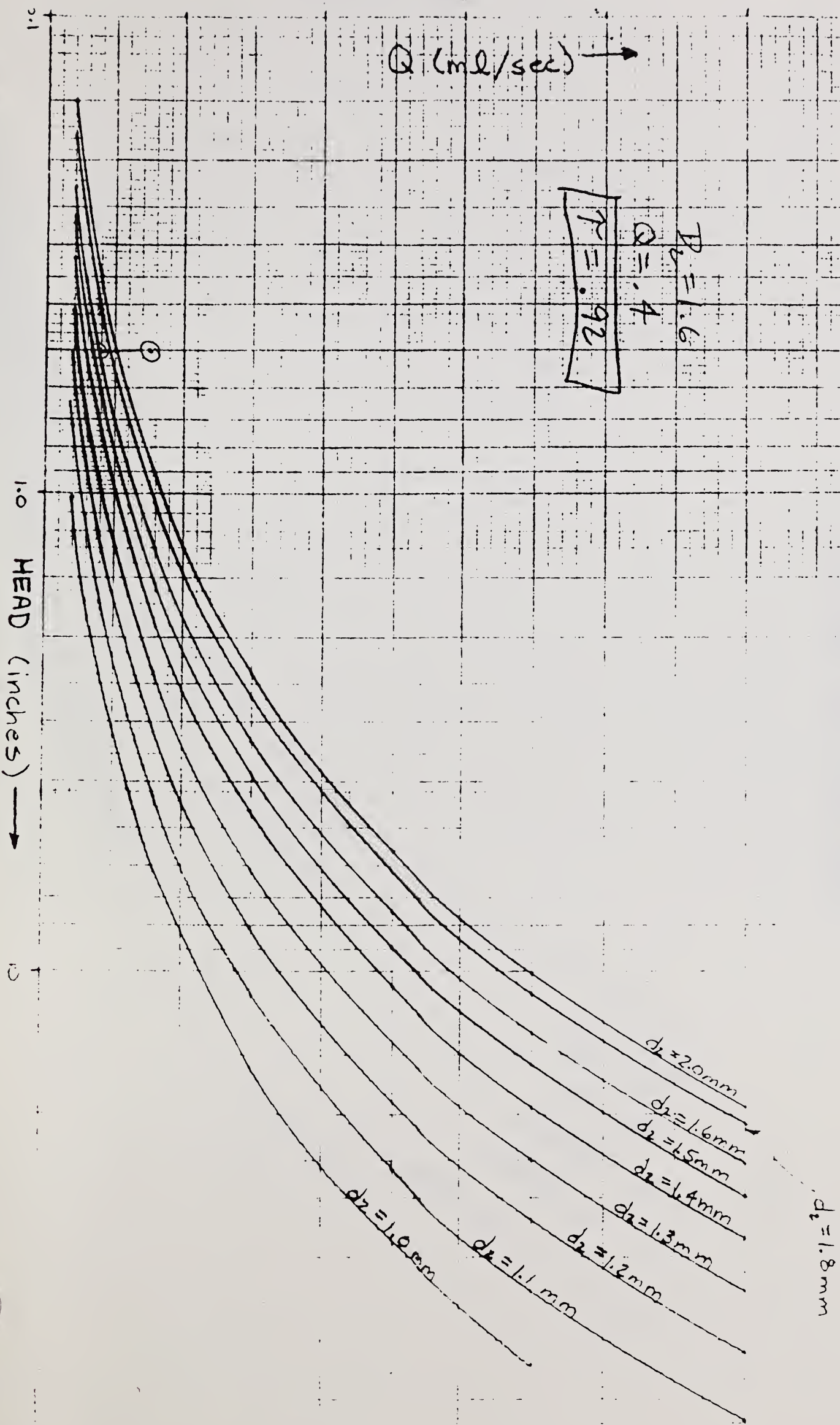
88C 105

Woodward So. 1

Distilled water

# FLOW VERSUS HEAD FOR VARIOUS PINHOLE DIAMETERS

(LAMINAR FLOW ASSUMED)







Woodward Soil

88C105  
Field Trial Water

# FLOW VERSUS HEAD FOR VARIOUS PINHOLE DIAMETERS (LAMINAR FLOW ASSUMED)

No Erosion

$Q$  (ml/sec) →

HEAD (inches) →

0.1

1.0

100

